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Potential Cost Savings From Grain Dependent Branch Line Rationalization

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Potential Cost Savings From Grain Dependent Branch Line Rationalization

by
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Research Branch
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Preface

The Research Branch of the CTC maintains a work program on the handling and transportation of Prairie grain. This program essentially involves the analysis of the grain marketing system by its major transportation and handling sub-components -- a) rail transport, b) truck transport, c) elevator handling, and d) vessel transport -- with a view to understanding the cost structures of each and how they are inter-related. The ultimate goal of this program is to integrate these components into a system model which would permit the evaluation of alternative grain transport scenarios.

An earlier Research Branch report entitled Grain Unit Trains - Estimated Potential Cost Savings on a System Basis by Joseph Kruger presented estimates of the cost savings which could arise from replacing conventional with unit train service. The current paper by Dennis Ward attempts to identify inefficient branch lines whose abandonment would promote the accummulation of larger stocks of grain at fewer locations. This concentration would, in turn, improve efficiency and push the grain transportation system towards the savings associated with unit train operations. Significant potential for net savings and a direction for more detailed examination are indicated.

The opinions expressed herein are those of the author and do not necessarily reflect the views of the Canadian Transport Commission. Comments on this draft would be welcomed by Dennis Ward, Andrew Gemmell or Joseph Kruger, at 819-997-6541 or by myself at 997-6025.

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Of course, errors and/or omissions which might remain are the responsibility of the author.

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Summary

This paper was undertaken to extend the analysis initially advanced in another Research Branch paper entitled "Grain Unit Trains - Estimated Potential Cost Savings on a System Basis" by J. Kruger. The result of Kruger's paper was that savings in excess of $58 M could be achieved if current rail operations could be replaced by unit trains in moving grain to export position. Since the initial release of Kruger's paper, new information suggests that this is a conservative estimate and higher savings could be realized if branch line rationalization was promoted.

The current paper identifies branch lines which are the most costly components in the system since their abandonment will generate the most significant cost savings in the short run. Over a longer period of time, branch line rationalization will result in increased concentration of grain at fewer points, on higher capacity track, and being moved in more fully loaded steel hopper cars. A rough estimate shows that a 1 million tonne station would be required to originate unit trains on a regular basis, but to achieve this ideal and reap the maximum savings, radical rationalization would be required.

The accompanying analysis identifies branch lines whose average movement costs exceed the highest cost alternative (Producer Straight Trucks). This approach shows that 1460 miles and their total line-related variable costs of $23.561 M could be abandoned with a resulting annual savings range of $14.4 M to $21.4 M after allowing for increased truck haulage costs. These savings are based on an estimated savings range of 61%

to 91% derived from the analysis of one CN (Inwood) and one CP (Colony) high cost branch line. If a more radical rationalization which included branch lines having limited carrying capacity was undertaken, an additional 2,998 miles of branch lines would be affected. Total annual savings of $40.9M to $60.9M (including the above) could be expected if the savings range identified for the Inwood and Colony Subdivisions is representative of all branch lines.

The methodology employed in this paper overestimates additional road haulage requirements and, hence, the above savings range is conservative. Estimates of additional mileage derived from the Producer Haul and Elevator Receipts model range between 42% and 66% of those derived herein and, as a result, suggest a higher range of savings of 75% to 94% of current rail expenses. Additional marginal savings might also be achieved if the above rationalization shifted loading to higher capacity lines, since fewer cars with higher gross weights would be required.

Finally, the formation of solid trains with these heavier cars would tend to generate savings comparable to those estimated by Kruger. If we assume that these savings can be pro-rated according to the level of direct savings, then total annual savings from rail rationalization could range between $28.4 million and $120 million. Passed back through the WGTA rate-making process, these amounts would lower rates for all other producers by 4.1% to 17.3%. Accordingly, while the initial savings might appear small, it makes the subsequent economies possible. Without branch line abandonment, neither the initial concentration of grain stocks in centralized locations nor the spotting and heavier loading of larger blocks of cars with their

associated operational economies would occur. All told, the rationalization of high cost branch lines would yield substantial dividends in both cost savings and operational efficiency.

Savings generated through branch line rationalization will reduce the eligible costs used to adjust the WGTA rate scale. As a result, future rates will be lower than they would be without rationalization. Reductions in rates could be large enough to offset incremental trucking costs associated with rationalization if they were entirely passed back to producers. For this and other reasons, additional trucking costs should be borne by the producer. Abandonments would also relieve pressure for increased Federal assistance and thus stabilize Federal commitments.

As a final note, the above results were derived using data from 1984 which may or may not be a "representative" year with respect to grain production, transportation and scheduled track maintenance. The results must therefore be viewed as a first approximation of both the segments which should be abandoned and the savings which can be expected. To the extent that abandonment candidates are identified herein, further micro studies of these lines for other years should be undertaken to determine if the current analysis properly represents the branch lines in question. These studies might also be extended to include financial and market share impacts on affected elevator companies, an aspect which has been excluded from the present analysis.

Notwithstanding the above comments, the general results contained in this paper are likely valid over the wide ranges of production evidenced

by regional variations in shipments between good and bad harvests since a large share of branch line costs do not deviate greatly over the short run (e.g. cost of capital, maintenance, depreciation and taxes). This view is supported by a CTC Research study which used 1981 cost and traffic data to produce a listing of high average cost branch lines which contains many of the same branch lines enumerated for 1984. Ten of 19 CN branch lines selected in 1981 appear in the list of 18 high cost CN branch lines in 1984 while 7 of 10 CP branch lines re-appear in the listing of 19 high cost CP branch lines in 1984. While relative rankings and absolute cost levels changed between these two years, lines which were considered to have high average costs in 1981 tended to have high average costs in 1984. The larger listing for 1984 supports the railways' contention that the improvement in their financial health caused by the enactment of the WGTA allowed them to increase maintenance of their grain dependent branch line system. Since traffic has not increased on these lines, the result has been a substantial increase in the average cost of operation on a per tonne-km basis.

Chapter 1: Introduction

The standard model for the analysis of Canadian economic development is based on the exploitation of resources which were in high demand in other parts of the world. Early settlement and development was influenced by the resource of the day - fish, fur and timber - and by the mode of transportation utilized to access the resource in question. Due to the vast distances between the site of the given resource and the ultimate market, exploitation was highly dependent on cheap and efficient transportation. This situation still exists today with respect to the exploitation of grain growing potential on the Prairies, especially in view of the agrarian reforms occurring in China and the Soviet Union which threaten to drastically curtail Canada's largest export markets.

The problem of the increasing cost of maintaining the Prairie branch line network and its associated impact on the cost of delivering grain to world markets has been addressed on numerous occasions. As a result, 554.6 miles of Prairie branch lines have been abandoned since 1981, as enumerated in Appendix I, and a further 328.6 miles are scheduled for abandonment in 1986 or as soon as segments of these lines are connected to existing lines of the competing railway. In total, this mileage is equivalent to 11.7% of the 1985/86 mileage of grain dependent branch lines and probably represents a substantial savings to the rail network with respect to the transportation of statutory grains.

Although the importance of rail rationalization is understood, a clear policy stating where and when it will occur does not exist and

therefore an element of uncertainty is added to the capital expenditure plans of railway and elevator companies. The attempt of the current analysis to objectively define a group of lines for abandonment could provide a more explicit framework for capital expenditures by the affected parties.

The genesis of this paper is an earlier Research Branch Working Paper entitled "Grain Unit Trains - Estimated Potential Cost Savings on a System Basis" by J. Kruger which estimated that if all grain could be shipped in unit trains, substantial savings could be realized. However, to marshall unit trains, grain would have to be available at a single site in quantities sufficient to load trains of perhaps 100 cars.

Conceptually, it was determined that the marshalling of a sufficient number of cars to form a unit train would best be accomplished on an incremental basis. That is, individual elevators with low annual handlings would not likely accumulate enough grain in a timely fashion to make a unit train operation an economic proposition. These facilities should be abandoned and their handlings redirected to proximate elevators. These elevators would subsequently be assessed to determine if they handled sufficient stocks to load a unit train and, if not, the above process would continue until enough stations were closed so that the redirected grain was accumulated in sufficient quantities to enable a unit train operation. To the extent that grain deliveries were "rolled up" from lower to higher density elevators, the operation of the rail-line linking these points would be non-essential if the operation of trucks could be shown to be less costly. In this way, savings would be equal to the difference between the costs of

branch line operation and those associated with trucking plus any cost reductions arising from the more efficient rail operation.

To identify segments which might be proposed for abandonment, average costs were calculated and used in conjunction with other descriptive variables; namely, annual elevator handlings, traffic density and track capacity. In addition, the notion of a solid train operation, which has many of the operational cost characteristics of a unit train, was adopted. A solid train, for instance, could operate between a specific origination-destination station-pair but the cars composing the train would be marshalled, in blocks, from a number of distinct origin stations. This approach seemed more realistic than a strict unit train operation. In addition, since unit costs for solid trains are comparable to those of unit trains, the operational savings identified in the study "Grain Unit Trains - Estimated Potential Cost Savings on a System Basis" remain valid in the context of the current paper and would be in addition to any savings estimated in this analysis. We now turn to a discussion of the above criteria and identification of branch lines displaying these characteristics.

Chapter 2: Criteria for Rail Rationalization

This paper accepts the premise that the efficiencies associated with moving grain in larger blocks will result in substantial savings. However, to achieve these savings, grain must be accumulated in larger volumes at fewer locations so certain elevators and the rail lines serving them will become redundant. To identify these elevators and line segments, annual elevator shipments, branch line traffic density, track capacity and average costs of moving grain on grain dependent branch lines were used. Other variables such as elevators with low annual handlings, low traffic density and a track capacity below 263,000 gross lbs. were also assessed but are included here primarily as descriptive variables since it is ultimately the difference in rail and road costs which determines the magnitude of potential savings.

These criteria are discussed in parts a), b), c) and d) below and branch lines having these characteristics are identified. Part e) pools these results and identifies one CN and one CP branch line for further analysis.

Before proceeding, it should be noted that traffic and cost data used in the following analyses pertain to the 1984 calendar year and, therefore, might not be representative of circumstances in a "normal" year. To the extent that abnormal expenditures were incurred or traffic varied significantly from normal patterns, results might not be the same if other years were tested. However, since the intention of this paper is, primarily, to identify branch lines which should be further analysed prior to

abandonment, the branch lines mentioned herein are fairly identified in the context of the test year.

Finally, the above measures of branch line usage and cost do not represent an exhaustive list of the available indicators. Other researchers might prefer other measures but, it is felt, nonetheless, that the range of criteria tested is broad enough to give a fair depiction of the relative health of Prairie branch lines.

a) Average Costs

In preparing this section, data were gathered to allow a comparison between rail transportation and the logical alternatives of farm and commercial trucking. To highlight high cost branch lines, cost data were obtained from the RTC Costing Review and transformed into cents per net tonne-kilometre estimates using originating, terminating and overhead (bridge) traffic data supplied by the Railways. These data are contained in Appendix IV.

Branch line costs do not include the volume - related costs which are incurred in moving traffic on the lines in question. However, this component represents a relatively small share of total costs and will not affect the substantive results of the analysis although its exclusion will mean that the estimates will be conservative.

Since branch lines do not all have the same cost characteristics nor the same traffic patterns, the cost of moving one tonne a distance of one

kilometre can vary widely from branch line to branch line. However, trucking costs display a much narrower variation according to IBI's 1985 study (11) with ranges of 3.0 - 8.0¢ and 5.0¢ - 13.0¢ per net tonne -km being estimates of the respective 1984 costs of operating commercial semis or A trains and Producer Semis or Straight trucks in short haul (50-150 km) operations. When these ranges are compared to the cost estimates contained in Appendix IV, they show that, of CN's 56 grain dependent branch lines (GDBL), 18 have costs in excess of 13.0¢ per net tonne-km as follows: Acadia Valley, Amiens, Athabasca, Bengough, Big River, Carlton, Chelan, Corning, Demay, Erwood, Inwood, Oakland, Paddockwood, Porter, Rhein, Riverhurst, Ste. Rose and Winnipegosis.

In total, the above segments amount to 637.3 miles (19.5% of 1984 GDBL mileage and 20.9% of line related variable cost) and had a combined average cost per tonne-kilometre of 43.66 cents which is well in excess of the comparable trucking costs for either a producer or commercial truck operation. This large differential makes these segments likely candidates for abandonment.

In addition, 19 of CP's 53 grain dependent branch lines have an average cost greater than 13¢ per net tonne-km. Acme, Amulet, Assiniboia, Bassano, Burstall, Cardston, Colony, Dunelm, Empress, Furness, Kisbey, Lac du Bonnet, Langdon/Strathmore, MacLeod, Reford, Russell, Turin, White Fox and Winnipeg Beach represent a combined mileage of 825.1 (22.2% of 1984 GDBL mileage and 24.7% of total line-related variable costs) and have a combined average cost of 40.52 cents per net tonne-km.

Since potential savings from rail rationalization depend on cost differentials, all of the above-mentioned lines were considered as serious candidates for further analysis and have been displayed on a map in Appendix VI.

b) Elevator Handlings

Assuming that low elevator handlings provide a valid basis for identifying branch line segments that should be abandoned, traffic statistics on the rail movement of Western grain for the calendar year 1984 were obtained from the WGTA Traffic Reporting System. The distribution of stations by number of direct shipment cars (i.e. excluding milling in transit carloads) originated for the years 1974, 1977, 1980 and 1984 can be found in Table 2.1. These data represent approximately 98% of all carloads and reveal that the prairie branch line system has undergone a continuous reduction in origin stations loading grain. The number of loading stations has decreased by about 25% in the past ten years from a high of 1,658 stations to 1,237 stations in 1984.

The concentration of shipments at elevators having large annual handlings is also apparent. Stations originating 200 or fewer grain cars per year (i.e. less than 4 cars per week) experienced a relative decline from 63.6% of total stations in 1974 to 32.2% in 1984. This tendency reflects the ongoing rationalization of the prairie rail network. Distinguishing between grain and non-grain dependent branch lines, low-density stations on grain dependent branch lines were characterized by a lower average weight per car than stations positioned on non-grain dependent branch lines as shown in

Table 2.2. This indicates that grain dependent branch lines are less efficient than non-grain dependent branch lines. Therefore, origins characterized by low handlings located on grain dependent lines were emphasized in the analysis. In addition, low loading main line elevators were excluded from further study since car loadings would tend to reflect operational rather than capacity considerations.

Table 2.1: Distribution of Stations by Number of Direct Shipment Cars Originated Years 1974, 1977, 1980 and 1984*

Total Cars Loaded	Number of Stations				Percentage Distribution			
	1974	1977	1980	1984	1974	1977	1980	1984
1-50	267	192	139	104	16.1%	12.7%	10.0%	8.4%
51-100	310	213	147	80	18.7	14.0	10.6	6.5
101-200	477	454	349	214	28.8	29.9	25.2	17.3
201-300	292	269	286	249	17.6	17.7	20.6	20.1
301-500	242	269	277	301	14.6	17.7	20.0	24.3
501-750	55	85	123	160	3.3	5.6	8.9	12.9
751-1000	10	22	38	65	0.6	1.5	2.7	5.3
Over 1000	5	13	26	64	0.3	0.9	1.9	5.2
Total	1,658	1,517	1,385	1,237	100.0%	100.0%	100.0%	100.0%

* The tabulation excludes traffic originating on the NAR and delivered to CN or CP at Edmonton or the CN at Grande Prairie. This traffic which represented about 4% of total traffic in 1984 was excluded from the 1974, 1977 and 1980 data since Snavely was only studying CN and CP. To be consistent with this earlier treatment, traffic from the former NAR is also excluded for 1984.

Source: 1974, 1977 and 1980 data from p. 28 1980 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under the Statutory Rates, Snavely, King and Associates, January 1982.

Table 2.2: Average Weight Per Car For Low-Handling Stations Located on Branch Lines (1984)

Total Cars Loaded	Average Weight Per Car (Tonnes) Grain-Dependent	Non-Grain Dependent
0-50	64.5	74.8
51-100	63.3	77.9
101-150	66.4	72.9

Stations shipping 0-50, 51-100 and 101-150 car loads in 1984 were assessed to determine if there was a tendency for them to cluster on certain branch lines but little evidence of concentration was exhibited. In total, 273 grain-loading stations in the Prairie rail network shipped fewer than 150 cars in 1984. Ninety eight (36%) of these were positioned on grain dependent branch lines, 55 (20%) were on non grain dependent branch lines and 120 (44%) were on main lines. At this level of aggregation, the distribution of stations does not exhibit any pattern that would lead to firm conclusions with respect to potential abandonment candidates. However, if there were more than two low-handling stations on the branch line or if two low-handling stations were found on a relatively short branch line, the branch line in question has been proposed for further evaluation.

In total, 14 branch lines representing 989.9 miles or 14.2% of the grain dependent branch line network were identified by the above procedure. These branch lines are listed in Table 2.3 below. In addition, a listing of the stations included in this analysis as well as a list of low-traffic stations on non-grain dependent branch lines can be found in Appendix IV.

Table 2.3: Potential Candidates for Further Analysis

Province	Branch Line	Length of Line (Miles)	No. of Low-Density Stations	Car Loads Per Station in 1984	Total Grain Loading Stations 1983/84
Alberta	Bassano	118.4	5	101-150	8
	Bonnyville	61.1	3	51-100	3
	Stirling	84.5	3	51-100	10
Saskatchewan	Brooksby	51.1	3	0-50	5
	Colony	24.6	2	101-150	3
	Dodsland	79.2	4	0-50	7
	Fife Lake	79.8	3	51-100	7
	Kisbey	61.7	5	51-100	7
	Rhein	53.8	2	0-50	5
	Vanguard	74.3	3	101-150	9
	Wood Mountain	64.9	3	101-150	6
Manitoba	Cowan	98.5	3	0-50	4
	Glenboro	154.0	4	101-150	13
	Miami	102.2	3	0-50	13
Total		989.9	46		100

Total Miles of grain dependent branch line: 6987.7
Total Low-density stations plotted : 99

c) Traffic Density

According to RTC analysis undertaken as part of the Costing Review under Section 38 of the WGTA, the major car types in grain service on grain dependent branch lines are government hoppers and box cars with 52% and 31% of total carloads respectively. Including other hoppers and foreign box cars, these shares rise to 68.0% and 31.5% respectively. However, hoppers, due to their larger carrying capacity, represent a larger share of tonnage with 72.7% as opposed to box cars which carried only 26.8% of total tonnage. In addition, the following table supports the notion that CP has a more

efficient grain dependent branch line operation than CN, at least to the extent that heavier loadings can be used as an indicator. For all car types, except foreign box which is a negligible factor, CP's loadings per car are significantly heavier than CN's. The average CP box car carries a 5.45% heavier load while the average government hopper on CP lines carries a load which is 19.7% heavier than its CN counterpart. On average, CP carloads by car type are 12.7% heavier than the corresponding CN carloads.

CN's position is that because they handle larger volumes of low weight grains (rapeseed, oats, etc.) they cube out at lower weights than CP. However, this position has received only marginal support from RTC studies undertaken since the 1985/86 crop year to determine the CN adjustment which forms part of the annual rate scale determination. While other variables such as ports served, (e.g. Churchill), line capacity and equipment (e.g. aluminium hoppers) could also account for these differences, the perhaps simplistic notion that efficiency can be measured in terms of a fully loaded hopper still indicates that CN has the potential to reap greater relative savings from branch line rationalization than has CP.

Table 2.4: Shares of Grain Dependent Branch Line Traffic by Car Type and Associated Tonnage and Average Weight Carried by Car Type CN, CP, Total 1984

	Box	Foreign Box	Hopper	Foreign Hopper	Govt. Hopper	Tank	Total
CN							
Carloads (%)	31.37	0.02	10.46	11.37	46.79	-	100.01
Tonnes (%)	27.62	0.02	10.48	12.24	49.64	-	100.00
Tonnes/ Carload	55	58	63	67	66		63
CP							
Carloads (%)	31.62	-	8.80	0.74	57.70	1.13	99.99
Tonnes (%)	25.94	-	8.27	0.76	63.96	1.07	100.00
Tonnes/ Carload	58	53	67	73	79	67	71
Total							
Carloads (%)	31.49	0.01	9.66	6.24	52.06	0.55	100.01
Tonnes (%)	26.75	0.01	9.34	6.33	57.01	0.55	99.99
Tonnes/ Carload	57	57	64	68	73	67	67

Source: Table 13 Preliminary Summary of the Characteristics of the Western Grain Movements by Rail in 1984, RTC.

Disregarding the differences exhibited by CN and CP, it was decided that branch lines which had annual carloadings and tonnages per mile of track which were less than 50% of the averages for all grain dependent branch lines would be the most likely candidates for abandonment. In 1984, each of CN's 3084 miles of grain dependent branch line[1] produced, on average, 37.3

[1] Actual CN grain dependent branch line miles are 3275.3 but there was no traffic on either the Herchmer Sub. from Gillam (M330.3) to Churchill (M509.9) or the Ste-Rose Sub from Ochre River (M0.0) to Ste. Rose du Lac (M11.7) so this mileage was excluded from consideration.

carloads and 2330 tonnes of traffic while each of CP's 3712.4 grain dependent branch line miles produced 28.9 carloads and 2,056 tonnes. This meant that if a CN branch line originated less than 18.6 carloads and 1165 tonnes, it would be included in the following analysis to test the extent of the savings that could be generated by its closure. For CP, the comparable statistics were 14.5 carloads and 1028 tonnes. Table 2.5 enumerates those grain dependent branch lines which met these criteria.

To further substantiate the selection of these lines as candidates for abandonment, the carload and tonnage data for these lines was analyzed to show the distribution of shipments as well as the average weight by car type and for total shipments to determine whether they exhibited a tendency towards lighter carloadings. The results in Table 2.6 show a heavier utilization of box cars on the branch lines in question but the tonnes per carload by car type differ only marginally from the comparable data for all grain dependent branch lines in Table 2.4.

In addition to the above branch lines, several CN lines exhibited either less than average carloads or tonnes (but not both), while some CP lines were only marginally over the above-mentioned limits. These are listed in Table 2.7.

Table 2.5 Grain Dependent Branch Lines Originating Less Than 50% of the Average Number of Carloads and Tonnes
CN and CP 1984

		Miles	Cars	Cars/Mile	Tonnes	Tonnes/Mile
CN						
Central Butte*	Moose Jaw Jct. (M39.2) - Central Butte (M92.5)	53.3	896	16.8	48,151	903
Chelan	Reserve (M0.0) - Crooked River (M60.1)	60.1	932	15.5	62,710	1,043
Cowan	North Jct. (M0.0) - Swan River (M98.5)	98.5	1,060	10.7	66,716	677
Denay*	Camrose Jct. (M0.0) - Byley (M25.0)	25.0	99	4.0	5,374	215
Inwood	Crosse Isle (M0.5) - Fisher Branch (M72.0)	71.5	418	5.8	23,071	323
Oakland	Delta Jct. (M1.0) - Oakland (M10.0)	9.0	117	13.0	6,569	730
Porter*	Oban Jct. (M0.0) - Cando (M18.0)	18.0	301	16.8	16,304	906
		335.4	3,823	11.4	228,895	682
CP						
Altawan	Shaunavon (M0.0) - Manyberries (M122.1)	122.1	1,566	12.8	105,890	867
Bassano	Empress (M0.0) - Bassano (M118.4)	118.4	736	6.2	65,478	553
Colony*	Rockglen (M0.0) - Kildeer (M24.6)	24.6	146	5.9	8,641	351
Empress	Leader (M88.2) - Empress (M111.8)	23.6	234	9.9	20,893	885
Kisbey*	Arcola (M0.0) - Weyburn (M61.7)	61.7	741	12.0	46,728	757
Strathmore	Langdon (M33.6) - Shepard (M45.1)	11.5	23	2.0	1,942	169
Winnipeg Beach*	Gimli (M58.0) - Riverton (M82.6)	24.6	150	6.1	8,576	349
		386.5	3,596	9.3	258,148	668

* These lines are referred to earlier in this chapter as having average carloads weighing less than 64 tonnes.

Table 2.6: Distribution of Carloads and Tonnes by Car Type and Average Load per Car For Selected Branch Lines 1984

	Box	Foreign Box	Hopper	Foreign Hopper	Government Hopper	Tank	Total
CN							
Carloads (%)	43.0	0	10.8	11.7	34.5	0	100.0
Tonnes (%)	39.6	0	11.1	12.8	36.5	0	100.0
Avg. Tonnes/Carload	55	0	62	66	63	0	60
CP							
Carloads (%)	33.8	0	9.2	0.4	56.7	0	100.1
Tonnes (%)	27.7	0	8.9	0.4	63.1	0	100.1
Avg. Tonnes/Carload	59	0	69	67	80	0	72
Total							
Carloads (%)	38.5	0	10.0	6.2	45.3	0	100.0
Tonnes (%)	33.3	0	9.9	6.2	50.6	0	100.0
Avg. Tonnes/Carload	57	0	65	66	73	0	66

Table 2.7: Branch Lines only Slightly Above Cut-off Values CN, CP, 1984

	Miles	Cars	Cars/ Mile	Tonnes	Tonnes/ Mile
CN					
Bengough* Bengough Jct (M0.0) - Willowbunch (M71.5)	71.5	1,439	20.1	77,780	1,088
Bonnyville Abilene Jct (M0.0) - Grand Centre (M61.1)	61.1	1,114	18.2	77,207	1,264
Average	132.6	2,553	19.3	154,987	1,169
CP					
Assiniboia* Amulet (M46.0) - Assiniboia (M111.1)	65.1	1,083	16.6	68,818	1,057
Fife Lake* Assiniboia (M0.0) - Big Beaver (M79.8)	79.8	1,412	17.7	82,443	1,033
Shamrock* Archive (M0.0) - Hak (M103.4)	103.4	1,875	18.1	110,209	1,066
Average	248.3	4,370	17.6	261,470	1,053

* Weight of average carload is less than 64 tonnes.

In Table 2.7, the average for CN is only slightly above the cut-off of 18.6 carloads and 1,165 tonnes while the averages for CP diverge more significantly from the associated cut-off values of 14.5 carloads and 1,028 tonnes. Significantly, the carload and tonnage figures for the three CP segments shown above are below the CN levels. Indeed, if CN levels were used as cut-offs for CP, these three would be included with the group listed in Table 2.5 and three other lines - Acme with 18.4 carloads per mile, Dunelm with 1,127 tonnes per mile, and Langdon with 18.2 carloads per mile - would appear in Table 2.7 above. All of the above segments have been mapped and appear in Appendix VI.

Referring back to total CN and CP grain dependent branch line mileage of 3,084 and 3,712.4, the mileage in Table 2.5 represents 10.9% and

10.4% respectively. The mileage in Table 2.7 adds an additional 4.3% and 6.7% to these estimates of low density branch lines which should be considered for abandonment. Indeed, some of these lines have already been considered for abandonment by the RTC and decisions have been rendered as follows:

Central Butte -	to be abandoned Aug. 31, 1987 contingent upon the construction of connection to CP Outlook Subdivision
Chelan -	ordered to continue operation
Inwood -	ordered abandoned Jan. 1, 1986
Oakland -	ordered abandoned Dec. 31, 1985
Porter -	ordered to continue operation
Colony -	ordered to continue operation

The current analysis should provide some insight into the cost effectiveness of the above decisions.

d) Track Capacity

A further indicator of the appropriateness of continuing to operate a given branch line is the load carrying capacity of the associated trackage. This variable has been alluded to several times in the foregoing discussion of the inefficiency of shipping grain in either box cars or half loaded hoppers. The most efficient system would ship only fully loaded hopper cars on rail capable of handling cars with a gross weight of 263,000 lbs. If we assume a slightly less efficient system that considered a fully loaded hopper

would carry 84 tonnes of grain, the 1984 tonnage could have been shipped in 158,458 carloads which is 62,672 or 29% fewer than actually used in that year. Even if a lower goal of having all grain shipped in loads of 77 tonnes which was the average weight carried in CP hoppers, the 1984 shipments could have been carried in 191,385 hoppers, a saving of 29,745 cars and their related costs. This estimate represents 13% of 1984 carloadings and suggests that substantial car related savings could be achieved by more fully utilizing the carrying capacity of rolling stock.

Accordingly, data on track capacity were gathered to highlight those segments which were restricted to cars weighing 220,000 gross lbs. or less. The initial goal was 263,000 gross lbs. but CN operates several segments at 250,000 gross lbs. and it was deemed that this limit was high enough that the incremental savings associated with the higher capacity would be relatively small. As a result, the following segments were identified as abandonment candidates due to their restricted carrying capacity:

CN: Acadia Valley, Alliance, Amiens, Athabasca, Avonlea, Bengough, Big River, Blaine Lake, Bodo, Bolney, Bonnyville, Carlton, Central Butte, Chelan, Corning, Coronado, Cudworth from Meacham (M23.6) to Totzke (M38.8), Demay, Dodsland, Erwood, Inwood, Lewvan, Mantario, Matador, Neepawa, Oakland, Paddockwood, Porter, Preeceville from Lilian (M67.4) to Kelvington (M113.6), Rhein, Riverhurst, Robinhood, Rossburn, Ste Rose, Stettler, Tisdale, Turtleford, Weyburn, Winnipegosis.

Accordingly, 1652 miles or 50% of CN's claimed grain dependent mileage of 3,275 has a capacity of 220,000 gross lbs. or less.

CP: Acme, Altawan, Bromhead, Carman Spur from Elm Creek (M0.0) - Carman (12.2), Colonsay, Colony, Coronation from Kerrobert (M1.5) - Loyalist (M93.6), Dunelm, Empress, Fife Lake, Furness, Gravelbourg, Gretna, Kerrobert, Kisbey, Lac du Bonnet, Langdon, Lyleton, Macklin, Melfort, Neudorf, Notukeu, Reford, Russell, Shamrock, Stirling from Manyberries (M0.0) to Nemiskan (M28.0), Tyvan, Vanguard, White Fox, Willingdon from Streamstown (M12.6) to Derwent (M52.7), Winnipeg Beach (M52.7) and, Wood Mountain.

This criterion adds 1,598 miles or 43% of CP's claimed grain dependent mileage of 3,712 to the pool of abandonment candidates. A map displaying branch lines by track capacity is contained in Appendix VI.

e) Selection of Grain Dependent Branch Lines for Further Study

Lines identified as having high average costs are presented with the other descriptive data, in grid fashion below.

Table 2.8: CN and CP Grain Dependent Branch Lines Identified for Rationalization by:

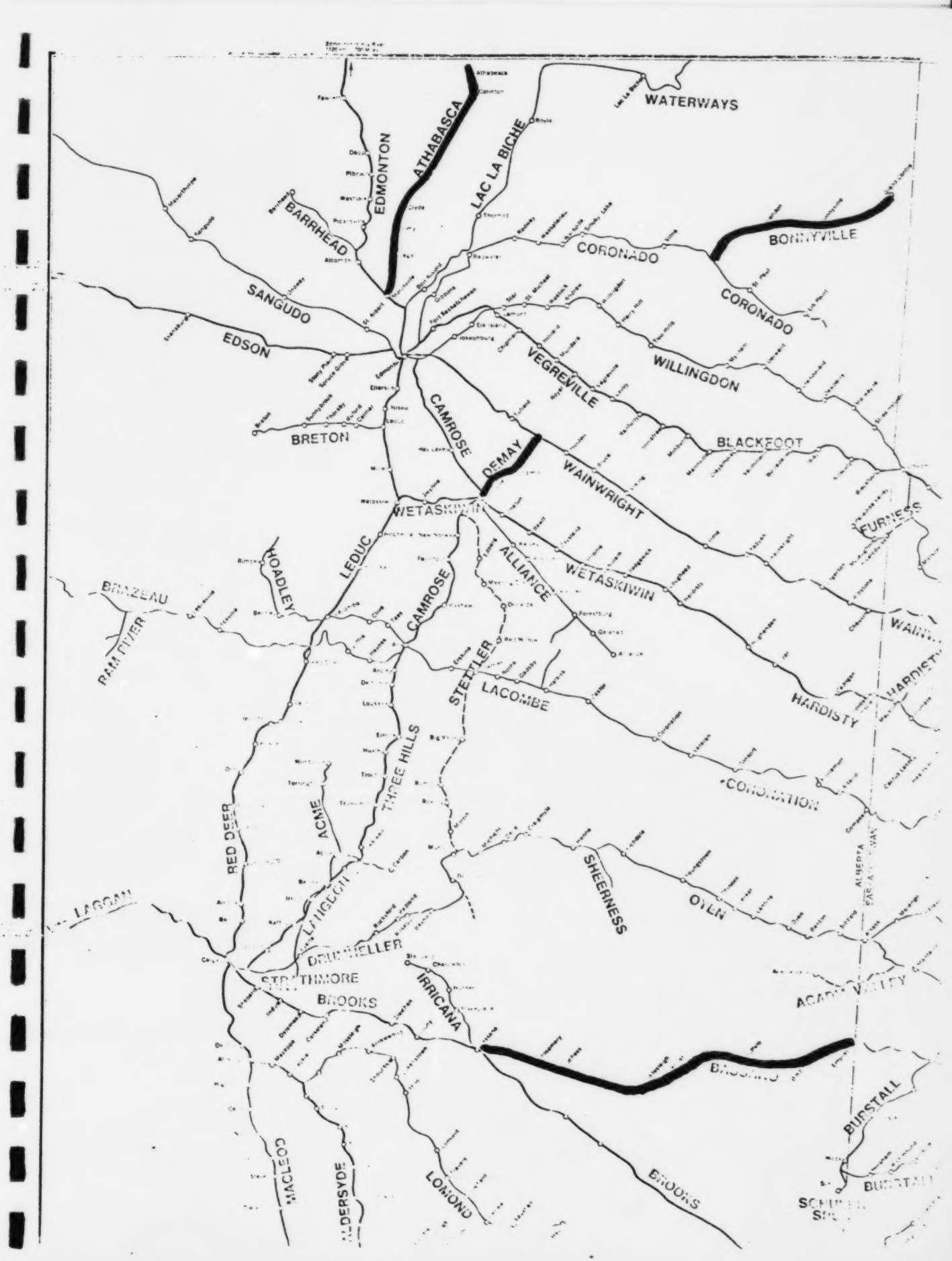
	High Average Cost	Low Density Shipping Points	Low Density Segment	Low Track Capacity
CN				
Acadia Valley	X			X
Alliance				X
Amiens	X			X
Athabasca	X		X	X
Avonlea				X
Bengough	X		X	X
Big River	X			X
Blaine Lake				X
Bodo				X
Bolney				X
Bonnyville		X	X	X
Brooksby		X		
Carlton	X			X
Central Butte			X	X
Chelan	X		X	X
Corning	X			X
Coronado				X
Cowan		X	X	
Cudworth				X
Demay	X		X	X
Dodsland		X		X
Erwood	X			X
Inwood	X		X	X
Lewvan				X
Mantario				X
Matador				X
Miami		X		
Neepawa				X
Oakland	X		X	X
Paddockwood	X			X
Porter	X		X	X
Preeceville (Lillian-Kelv.)				X
Rhein	X	X		X
Riverhurst	X			X
Robinhood				X
Rossburn				X
Ste Rose	X			X
Stettler				X
Tisdale				X
Turtleford				X
Weyburn				X
Winnipegosis	X			X

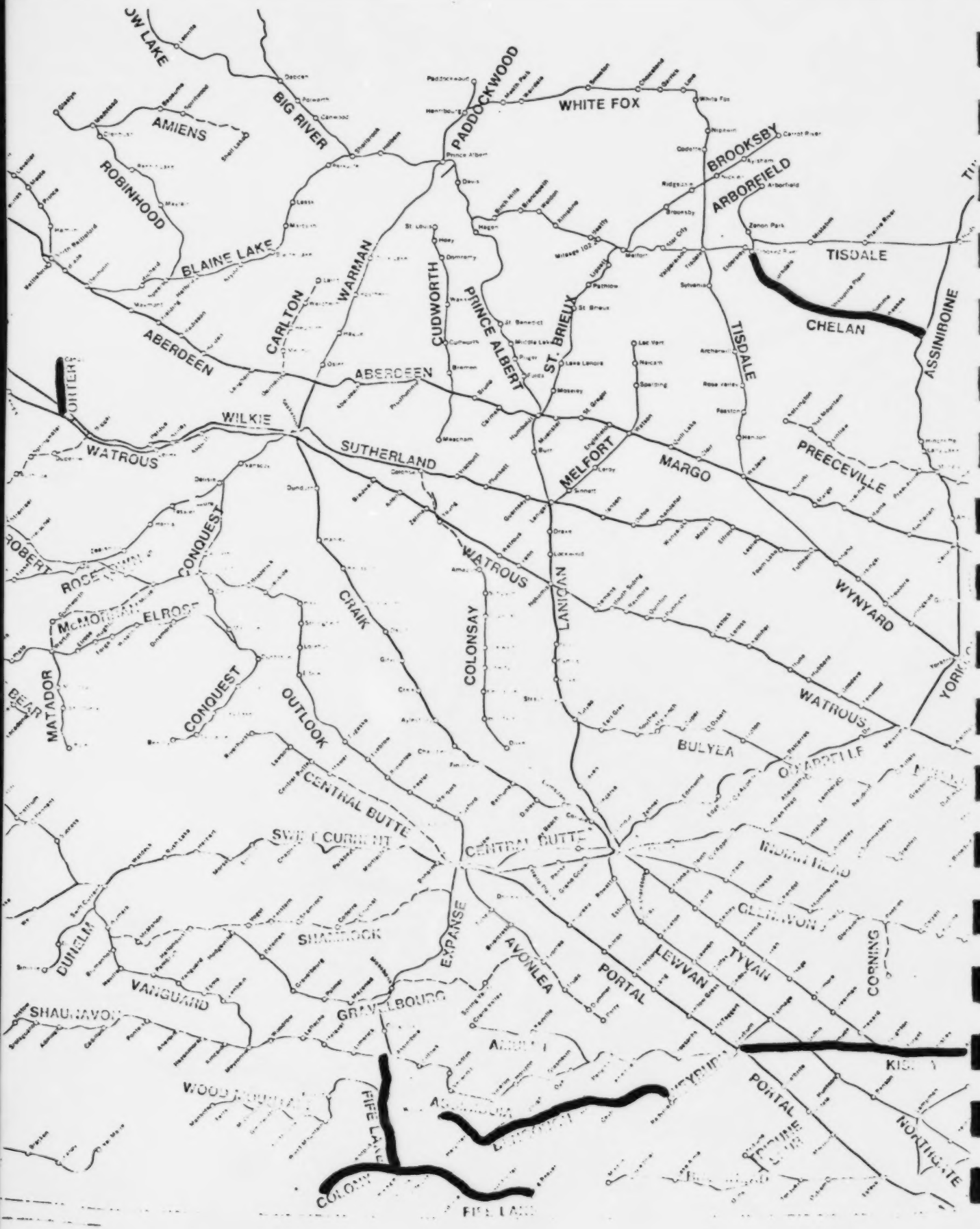
	High Average Cost	Low Density Shipping Points	Low Density Segment	Low Track Capacity
CP				
Acme	X			X
Altawan			X	X
Amulet	X			
Assiniboia	X		X	
Bassano	X	X	X	
Bromhead				X
Burstall	X			
Cardston	X			
Carman Spur				X
Colonsay				X
Colony	X	X	X	X
Coronation				X
Dunelm	X			X
Empress	X		X	X
Fife Lake		X	X	X
Furness	X			X
Glenboro		X		
Gravelbourg				X
Gretna				X
Kerrobert				X
Kisbey	X	X	X	X
Lac du Bonnet	X			X
Langdon	X			X
Lyleton				X
MacLeod	X			
Macklin				X
Melfort				X
Neudorf				X
Notukeu				X
Reford	X			X
Russell	X			X
Shamrock			X	X
Stirling		X		X
Strathmore	X		X	
Turin	X			
Tyvan				X
Vanguard		X		X
White Fox	X			X
Willingdon				X
Winnipeg Beach	X		X	X
Wood Mountain		X		X

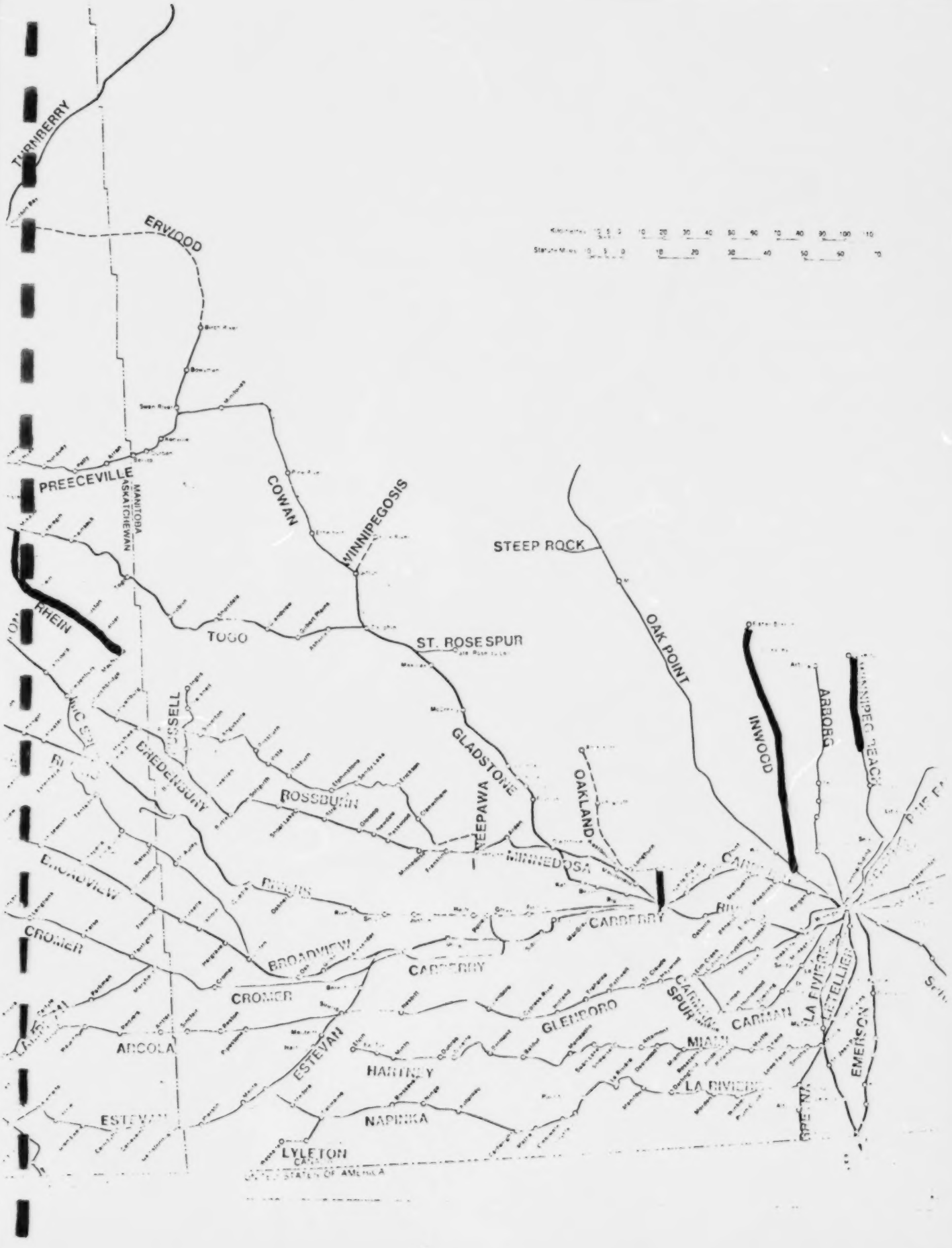
Referring to CN, no branch lines are identified under all four criteria but the Athabasca, Bengough, Bonnyville, Chelan, Demay, Inwood,

Oakland, Porter and Rhein appear under three categories each. With respect to CP lines, the Colony and Kisbey Subdivisions were identified by all four criteria while the Bassano, Empress, Fife Lake and Winnipeg Beach Subdivisions were identified by three criteria each. These subdivisions are identified on Maps 2.1, 2.2 and 2.3 following.

Assuming that identification by several criteria indicates branch lines that are better abandonment candidates than those identified by one or two criteria, all of these should be further analyzed. However, in an attempt to provide a flavour of what this analysis might show, the Inwood and Colony Subdivision are used in the following analysis. Movements along these subdivisions will be costed as if they were moved either by producer or commercial trucking and these costs will be compared to the actual costs currently incurred in operating these branch lines to ascertain the magnitude of potential savings associated with a shift to truck haulage.


WATERWAYS
ATHABASCA
EDMONTON
LAC LA BICHE
BARRHEAD
BONNYVILLE
CORONADO
SANGUDO
EDSON
VEGREVILLE
WILLINGDON
BRETON
CAMROSE
DEMAY
WAINWRIGHT
BLACKFOOT
WETASKIWIN
FURNESS
LEDUC
HOADLEY
ALLIANCE
BRAZEAU
RAM RIVER
STETTLER
LACOMBE
HARDISTY
THREE HILLS
ACME
RED DEER
CORONATION
SHEERNESS
OYEN
LANGDON
DRUMHELLER
STRATHMORE
BROOKS
IRRICANA
BASSANO
BURSTALL
MACLEOD
LOMOND

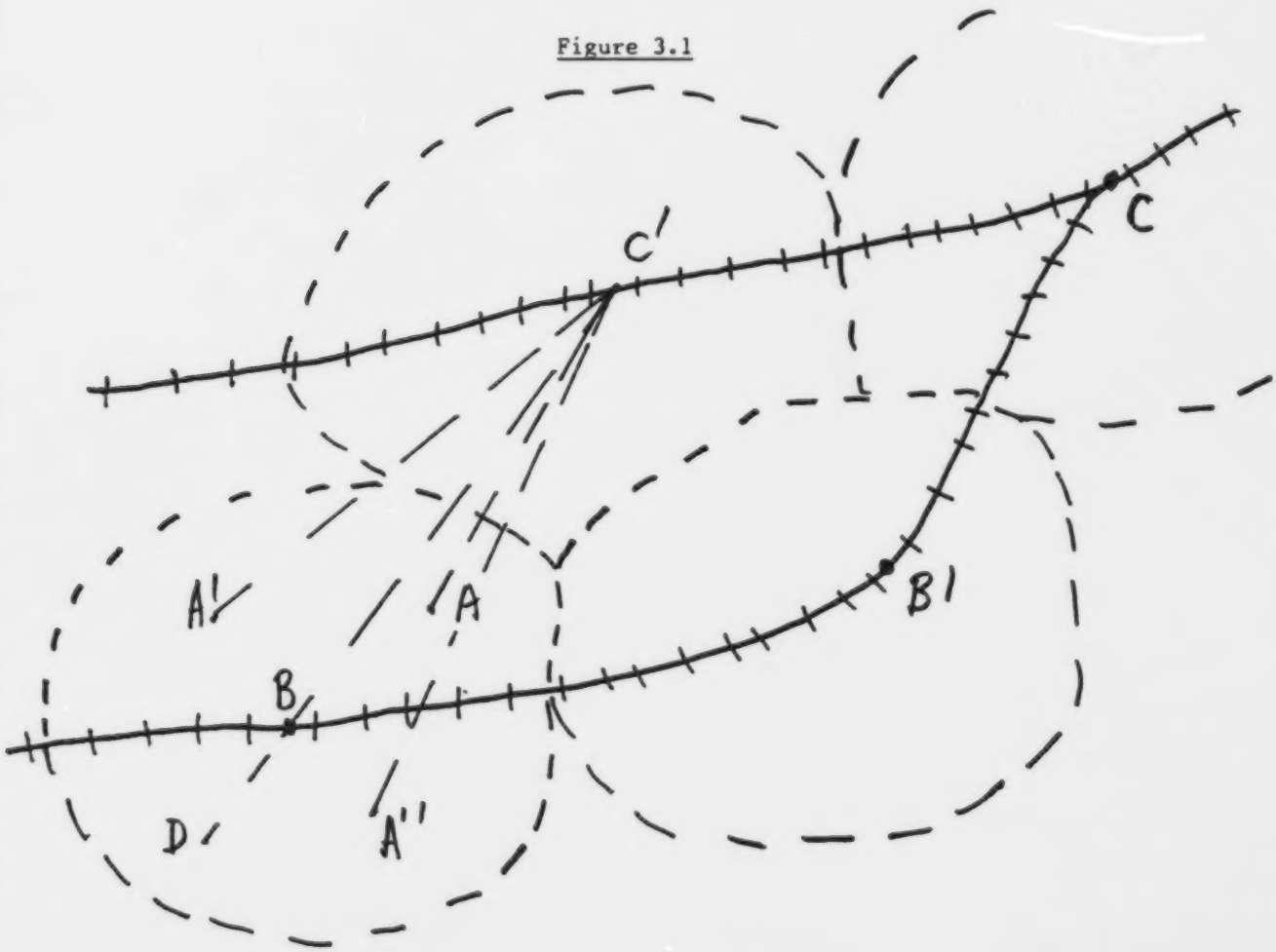

JW LAKE
BIG RIVER
AMIENS
ROBINHOOD
BLAINE LAKE
PADDOCKWOOD
WHITE FOX
BROOKSBY
ARBORFIELD
TISDALE
CHELAN
ASSINIBOINE
CARLTON
WARMAN
CUDWORTH
PRINCE ALBERT
ST. BRIEUX
ABERDEEN
OTTER
WILKIE
WATROUS
SUTHERLAND
MELFORT
MARGO
PREECEVILLE
WYNYARD
CONQUEST
ROBERT
MACNUTT
ELROSE
CRAIK
COLONSAY
LANIGAN
BEAR
MATADOR
OUTLOOK
CENTRAL BUTTE
SWIFT CURRENT
DUNELM
SHAMROCK
EXPANSE
AVONLEA
PORTAL
LEWVAN
TYVAN
CORNING
VANGUARD
SHAUNAVON
GRAVELBOURG
FIFE LAKE
COLONY
BULYEA
YORKTON


TURNBERRY
ERVIDOD
PREECEVILLE
MANITOBA
SASKATCHEWAN
COWAN
VINNIPEGOSIS
STEEP ROCK
OAK POINT
INWOOD
ARBORG
TOGO
ST. ROSE SPUR
GLADSTONE
OAKLAND
MINNEDOSA
ROSSBURN
BRANDON
CROMER
BROADVIEW
CARBERRY
GLENBORO
ARCOLA
ESTEVAN
HARTNEY
NAPINKA
LYLETON
MIAMI
EMERSON
LA RIVIERE
STATES OF AMERICA

Chapter 3: Estimates of Cost Savings

In the following analysis, it will be assumed that elevators B, B', C and C' in Figure 3.1 currently receive grain from farms falling within the dashed boundaries around each of these points. It is further assumed that line segment BC, as well as the elevators at B and B' are to be abandoned. Increased road haulage will be calculated as if all grain from farms A, A', A" and D was hauled to the closest alternative rail point (C') via B. This measurement will overstate the costs of additional road haulage since it would be shorter for farms A, A' and A" to haul directly to C'.

Figure 3.1



If the farm specific data base from the Research Branch Producer Haul and Elevator Receipt (PHAER) system had been used, a more accurate picture of additional truck hauling requirements could be obtained. This is true because PHAER takes the farm as the starting point for grain deliveries and, if an elevator is hypothetically closed, reroutes the delivery to the next closest elevator from the geographic centre of the farm. This procedure results in a much smaller estimated increase in road haulage than that derived from the present procedure which relies on railway data and selects the closest alternative elevator from the one selected for abandonment rather than from the centre of the delivering farm.

In the following examples, additional road haulage is 28.2 and 23 miles as compared to estimates of 18.6 and 9.7 derived from the PHAER model for the Inwood and Colony Subdivisions respectively. Increased truck costs would therefore be only 66% and 42% of those estimated below with the result that the savings range would be 75% to 94% of current rail costs rather than the range of 62% to 89% calculated below. Accordingly, the following estimates can be considered to be conservative especially at the lower end of the range where use of PHAER mileage boosts savings estimates by 21%.

Inwood (CN)

In 1984, the Inwood Subdivision originated 23,000 tonnes of statutory grain from Fisher Branch (17079.07 tonnes) and Broad Valley (6789.477 tonnes). Of these totals, 89% was delivered to Thunder Bay, 10.8% was delivered to Vancouver and the remainder was delivered to Eastern Canada.

If the Inwood Subdivision was abandoned and the elevators at current delivery points were closed, the closest alternative shipment point would be at Arborg on the CP Arborg Subdivision. The combined additional handlings of 23,869 tonnes would represent a 66% increase in Arborg's average annual handlings which would increase the turnover from 2.9:1 to 4.6:1. The current capacity of the elevator at Arborg is 13.0 thousand tonnes and deliveries have averaged 36.3 thousand tonnes over the ten year period ended in the crop year 1983-84.[2]

This scenario is, in fact, consistent with current operation of the Inwood since grain is currently being trucked from the elevators at Broad Valley and Fisher Branch on an experimental basis to ascertain what cost savings are possible. For 1984, the substitution of road for rail transportation would require that the 6789.477 tonnes at Broad Valley be hauled 39 km. while the 17079.070 tonnes at Fisher Branch would require road haulage of 48 km. In total, 1,084,585 tonne-kms. of truck haulage would be required at a total cost ranging between $32,538 and $140,996 depending on the efficiency of the respective commercial or producer hauling operation. However, since statutory grain only represented 85% of total branch line tonnage in 1984, these figures should be raised to $38,280 and $165,878 respectively to reflect total trucking costs.

In contrast, it cost CN $392,000 to operate the Inwood in 1984 so savings ranging between $226,122 and $353,720 or 57.7% to 90.2% might be

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[2] Source: Grain Deliveries at Prairie Points Crop Year 1983-84 Canadian Grain Commission

expected if road haulage is substituted for current rail operations. While volume-related costs on the Arborg would be higher with this increase in traffic, it is assumed that these costs would be no higher than the current train costs on the Inwood which are excluded from the above analysis.

The above data are displayed in Tables 3.1 and 3.2 below:

Table 3.1: Required Truck Haulage if the Inwood Subdivision is Abandoned

Current Delivery Point	1984 Tonnage	Distance to New Delivery Point (km)	Required Tonne - km
Broad Valley	6789.477	39	264,790
Fisher Branch	17079.070	48	819,795
	23868.547		1,084,585

Table 3.2: Road and Rail Costs of Transporting Grain from the Inwood Subdivision 1984

Road Costs

Tonne-kms	Rates/Tonne-Km (¢)	Costs ($)
1,275,982*	3.0 - 8.0 (commercial)	38,280 - 102,079
	5.0 - 13.0 (producer)	63,799 - 165,878

Rail Costs (line-related variable costs) $392,000

Savings range $392,000 - $ 38,280 = $353,720
$392,000 - $165,878 = $266,122

* Actual grain tonne-kms would be 1,084,585 but grain represented only 85% of the tonnage on the Inwood so tonne-km were adjusted upwards to reflect total traffic.

Colony (CP)

In 1984, the Colony Subdivision shipped 8,641 tonnes of grain to Thunder Bay (7,814) and Vancouver (827) from Killdeer (7,186 tonnes) and Canopus (1455 tonnes). If this segment was abandoned, the next closest delivery point would still be Rock Glen which would require 320,905 tonne-km of truck haulage in place of the previous rail movement as shown in Table 3.3 below.

Table 3.3: Required Truck Haulage if the Colony Subdivision is Abandoned

Current Delivery Point	Tonnage	Distance to New Delivery Point (km)	Required Tonne - km
Canopus	1,455	23	33,465
Killdeer	7,186	40	287,440
	8,641		320,905

At producer and commercial rates of 5.0 - 13.0¢ and 3.0 - 8¢ per net tonne-km, the above haulage could be accomplished at a cost ranging from $16,045-$41,718 to $9,627 - $25,672 as opposed to the actual 1984 costs of operation of $147,000. Accordingly, producer or commercial truck haulage would yield savings ranging between $130,955 - $105,282 and $137,373 - $121,328 which represent somewhere between 72% and 93% of the estimated required rail expenditure.

Rail Cost Impacts and Conclusions

The above analysis suggests that abandonment of the Inwood and Colony Subdivisions would result in a reduction of railway costs of approximately $539,000 and an increase in trucking costs ranging between $48,000 and $208,000 depending on whether commercial or producer haulage was utilized. The net impact would be a saving of $331,000 to $491,000. In addition, estimated eligible costs would be $539,000 lower and this would feed back into the determination of the rate scale. Using the base year of the WGTA as a point of departure, $810,000 represents 0.08% of the $695 million of eligible costs so all rates would be 0.08% lower than otherwise. While this is admittedly a small amount, if this analysis was expanded to include other candidate branch lines, a much more significant impact could be produced. It is, however, the specific on-line cost savings which are most significant as 61% to 91% of the current expenditure could be saved even after incremental trucking costs are accounted for.

If these savings ratios are applicable to the other branch lines identified as having high average costs of operation, total savings ranging from $14.4 million to $21.4 million might be expected to accrue from abandonment of the 1460 miles of high cost trackage enumerated in Chapter 2. This would still underestimate total savings since it does not include the savings which would arise through the increased operational efficiency associated with moving fewer, more heavily loaded cars. In addition, closure of only high unit cost branch lines would leave many branch lines with low carrying capacity still in operation. To bring these segments up to an acceptable level of repair, they would need rehabilitation which would, in

turn, result in most of these becoming high average cost branch lines. Assuming that the necessary rehabilitation costs would make these low track capacity lines candidates for abandonment under the high average cost criterion, 2998 additional miles of trackage (1483 CN and 1515 CP) would qualify. Costs associated with these segments were $43.424 M so savings of 61% - 91% would increase the above estimate to a range of $40.9 million - $60.9 million.

Of course, the more extensive the rail rationalization becomes, the greater is the likelihood that the operational efficiencies identified by Kruger will be realized. Assuming that the $59 million suggested in this previous paper would be associated with a high degree of rationalization, maximum savings of $120 million ($59 M plus $60.9 M) might be realized with the "radical" rationalization depicted in Map 5 of Appendix VI where all high average cost/low track capacity segments would eventually be abandoned. In terms of the WGTA base year eligible costs of $694.7 million, this would represent a 17.3% reduction in eligible costs in future years and hence, the factor used to adjust the rate scale would be 17.3% lower than otherwise. According to the WGTA, the average cost of moving one tonne of grain in the 1982-83 crop year was $22.05. If the adjustment factor was 17.3% lower in a future year, the average cost would be $3.81 less than it would be if these segments were not abandoned. At a producer trucking cost of 10¢ per tonne-km, the average farmer would be able to haul his grain an additional 38 kms. before consuming the system savings arising from "radical" rationalization.

On the other hand, the more limited rationalization which would result in $14.4 million to $21.4 million of direct savings could not be

expected to give rise to the full $59 million of savings associated with a unit train type of operation. However, if these system savings arise in proportion to the direct savings, then 24% to 35% or 14.0 million to $20.7 million would be rough estimates of the savings arising from more efficient train operations. In total, $28.4 million to $42.1 million could be saved if only the enumerated high cost branch lines were abandoned. As a percent of the WGTA base year eligible costs, these estimates would represent declines of 4.1% to 6.1% in the estimated eligible costs in future years. Again, using the average cost of transporting grain in 1982-83 of $22.05, these abandonments would result in rate decreases ranging between 90.4 cents and $1.35 per tonne. This means that producers could increase average road haul by 9 to 14 kilometres without affecting their total transportation costs.

In conclusion, while these must be viewed as rough estimates, if a large enough reduction in the eligible cost base can be effected, significant rate reductions can be passed back to the producers and, in many cases, these rate reductions would be sufficient to cover any increase in trucking costs which the producer would face due to branch line abandonment.

Chapter 4: Roadways - The Alternative Route

If branch lines were abandoned, the logical alternative mode of shipment would be the network of roadways in the immediate area affected. The existence and costs of these roadways become obvious variables in the decision to abandon so efforts were made to provide a picture of the Prairie road network as compared to that of the other Provinces. Unfortunately, the only data unearthed relate to the year ended December 31, 1976 so the accuracy of the following observations depends on whether these data, which appear in Appendix VI, reasonably reflect the current state of affairs.

In 1976, the Prairie Provinces accounted for 66.4% of total Canadian municipal roadway mileage. As shown in Table 4.1, Prairie road surfaces were primarily gravel and earth. while concrete and asphalt surfaces comprised shares well below the national average.

Combining Municipal, Provincial and Federal data, total kilometres of roadway, by province, were: Saskatchewan (206,192); Alberta (180,145); Ontario (160,653); Quebec (113,847) and Manitoba (81,398).

Table 4.1: Distribution of Municipal and Provincial and Federal Road and Street Kilometres by Type for Selected Provinces, 1976 (%)

Municipal	Ont.	Man.	Sask.	Alta.	Canada
Rigid Pavement (concrete)	2.9	4.3	.2	.5	1.6
Flexible Pavement (asphalt)	35.2	2.3	2.2	11.8	18.6
Gravel	57.8	64.1	53.8	59.3	54.4
Earth	3.9	29.3	43.8	28.4	25.3
Other	.1	-	-	-	.1
Provincial and Federal					
Rigid Pavement	5.2	2.8	-	-	1.0
Flexible Pavement	54.7	41.1	63.0	27.1	42.4
Gravel	36.3	55.3	27.0	60.0	48.3
Earth	3.3	.8	10.0	12.8	8.3
Other	.6	-	-	-	.1
Total					
Rigid Pavement (concrete)	3.4	4.0	.1	.4	1.4
Flexible Pavement (asphalt)	39.2	12.2	10.0	15.1	26.9
Gravel	53.5	61.8	50.4	59.4	52.3
Earth	3.8	22.0	39.5	25.1	19.4
Other	.2	-	-	-	.1

With respect to construction and maintenance expenditure, Prairie road surfaces received a relatively low level of expenditure on a per kilometre basis for both municipal and Federal/Provincial jurisdictions as shown in Table 4.2.

Turning to roadways under Federal and Provincial jurisdiction, the Prairie share of total Canadian mileage plummets to 27.7% and, with the exception of Saskatchewan, the Prairie provinces again demonstrate a tendency to gravel and earth surfaces.

Table 4.2: Construction, Maintenance and Administration Expenditure per Kilometre by Province for the Year Ended Mar 31, 1976
($,000's/km)

	Municipal	Federal/Provincial	Total
Newfoundland	8.431	11.315	10.668
Prince Edward Island	8.922	3.843	4.066
Nova Scotia	15.098	4.593	5.324
New Brunswick	17.091	6.302	7.559
Quebec	11.349	10.416	10.749
Ontario	6.207	15.637	8.112
Manitoba	1.525	5.075	2.436
Saskatchewan	0.700	4.464	1.179
Alberta	1.953	5.574	2.725
British Columbia	10.002	5.834	6.888
Yukon and NWT	19.993	7.341	7.888
Canada	3.518	7.854	5.031

Comparisons of expenditures by road type were not possible with the available data but, overall, the Prairie Provinces spent less than any other province with a weighted average expenditure of $1,993 per kilometre (40% of the national average). Whether the resulting roadways are adequate is not readily apparent although this level of expenditure is consistent with the highly dispersed and low density settlement pattern on the Prairies and the narrow tax base associated with the primary economic activity pursued in this region.

Branch line subsidies have allowed Prairie governments to avoid roadway expenditures considered normal in other parts of Canada since bulk commodity shipments have been transported by rail rather than road. As a result, "hard" decisions have not been made with respect to the number of

kilometres of roadway provided since, for the expected traffic volume, maintenance requirements were minimal.

Branch line abandonment could substantially increase tonnages on certain roads and expenditures would have to increase to ensure that local roads would be able to handle the increased demand. In this case, abandonment will shift the onus for the provision of a transportation infrastructure from the Federal to the Municipal government which generally has access to a very limited tax base and would be hard pressed to provide the necessary funds especially in view of the fact that expenditures per capita were among the highest in the country in 1976. Nonetheless, municipalities in the Atlantic region, which also tend to have narrow tax bases and comparably high per capita expenditure levels, are able to pay substantially more on a per kilometre basis than do Prairie municipalities.

Per capita payments are high at both the Federal/Provincial and Municipal levels although the Municipal level is very high in both Saskatchewan and Alberta as displayed in Schedule VI of Appendix V. For most of the other provinces, Municipal expenditures per capita increase as the municipal tax base broadens and the Federal/Provincial expenditures decline. However, the very high levels of per capita Municipal expenditure are suggestive of the extensive road network which must be maintained. This last point is highlighted in Schedule VII of Appendix V which shows that Saskatchewan has almost six times the national average kilometres of roadway per capita. Yukon and Northwest Territories (2.6), Alberta (2.5) and Manitoba (2.1) are also well above the national average with most of the other provinces lying below this figure.

The foregoing analysis suggests that the types of roadways on the Prairies are generally adequate, although if producers were required to haul their grain over longer distances, there would probably be pressure to upgrade certain roads to permit travel at higher speeds. Some argue that additional expenditures will substantially, erode any direct savings attributable to rail rationalization. Others argue that increased road usage would have only minimal impacts since multiple axle vehicles exert less force on the roadway than do producer trucks loaded beyond their rated capacities. If estimates of the unit cost of providing the current road capacity were obtained, they could be adjusted upward to reflect the higher capacity requirements which would be occasioned by branch line abandonments. This adjustment, however, would intuitively overestimate costs since a share of current expenditure is surely attributable to the harsh climatic conditions experienced in the Prairie provinces. It also seems reasonable that there are certain threshold levels of road maintenance which extend over a reasonably wide range of output. If increased tonnages carried over a given roadway did not cause total tonnage to exceed the threshold level, additional maintenance would not be required. Finally, farmers would tend to take the shortest route to their new delivery point yielding a much lower increase in roadway use. In conjunction, the above factors suggest that a linear extrapolation of current expenditures would produce significant overestimate of actual requirements occasioned by increased truck haulage.

Nonetheless, a rough order of magnitude can be calculated by applying 1982 estimates of $1215 and $2648 per kilometre[3] for Municipal roadway maintenance in Saskatchewan and Manitoba respectively to the 40 and 115 kilometres of roadway which would be affected by abandonment of the Colony and Inwood Subdivisions. At this rate, additional annual maintenance required on these roadways would have to increase by more than 64% to erase the savings associated with producer trucking and by more than 82% to erase those associated with commercial haulage.

While the impact on savings of the required additional maintenance costs is unknown, the fact that Saskatchewan's 1976 expenditure on Municipal roadways was only 20% of the national average while Manitoba's was 43%, suggests that a substantial share of any increased burden might reasonably be passed on to the municipalities affected. Since Saskatchewan has approximately six and Manitoba two times more kilometres of roadway per capita than the national average (Schedule VII, Appendix V), substantial latitude might exist for a reallocation of roadway maintenance expenditures through rationalization of the road network. To the extent that road rationalization freed up finances for increased maintenance in affected areas, savings would be unaffected. However, if roadway rationalization does not free up funds, other sources would have to be tapped to maintain roadways at acceptable levels.

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[3] This figure is derived using the Conference Board of Canada's implicit deflator for domestic product of 1.7361 for the period 1976-1982 from Table 5.2 of "The Provincial Economies".

Chapter 5: Conclusions

The foregoing analysis has demonstrated that road haulage would provide a lower cost alternative to the current operation of the Inwood and Colony Subdivisions. Savings ranging between 61% and 91% of current annual expenditures could be expected and, although some incremental road maintenance costs might be required, it is unlikely that these additional costs would absorb the savings generated from the abandonment of these branch lines. In addition, there might be some latitude for the affected Provinces to reallocate maintenance budgets in support of roadways which would be required to handle increased traffic.

If the savings indicated for the Inwood and Colony Subdivisions are representative, then the closure of the 1460 miles of CN and CP branch lines which have high average costs of operations could result in annual savings ranging between $14.4 M and $21.4 M after allowing for increased road haulage.

In addition, many branch lines, which are not currently "high cost", have limited carrying capacity and would require significant expenditures to bring them up to a capacity of 250,000 lbs. Assuming the required expenditure would transform these segments into high cost lines, an additional 2998 miles could be affected and total savings (including the above) could rise to $40.9 M to $60.9 M if trucking was substituted for branch line operations.

However, these direct savings represent only part of the picture since abandonments will result in larger car spots at fewer locations on higher capacity lines so individual cars will tend to be more heavily loaded. These changes will result in simplified and more efficient train operations which have the potential to produce additional savings in excess of $58 M as demonstrated by Kruger (12). If these operational efficiencies can be pro-rated on the basis of direct savings then total savings from abandonment could range from $28.4 M to $120 M on an annual basis. Finally, since costs are used in the WGTA rate-making process, these levels of cost reductions would result in further savings since rate decreases ranging between 4.1% and 17.3% could be expected for all producers. These decreases could go a long way towards defraying any additional trucking costs which might be associated with branch line abandonments.

In the final analysis, trucking appears to be a much more efficient method of moving Prairie grain stocks than continued operation of high average cost, low track capacity branch lines. However, this outcome is sensitive to the accuracy of the underlying assumptions.

Branch line rationalization is a complex issue and this paper has only scratched the surface. More work on traffic patterns and road capacity in areas where branch line closures could represent rational economic choices is necessary to support the conclusions reached in this paper. However, it appears that rationalization will improve the railways' financial positions and will allow them to plan their expenditures more accurately. At the same time, rationalization will reduce future eligible costs and will therefore ensure that the Government's fixed commitment will not rise so any savings,

within a broad range, will fall to producers in the form of reduced tariffs. To promote this favourable outcome, however, legislation must allow for abandonment of branch lines when all parties can agree that this is a desirable event.

While branch line abandonment will adversely affect producer's hauling requirements, the continuing proximity of rail access to most producers is an anachronism handed down from Canada's past before the supremacy of road transport for short hauls became evident. Although rail will continue to be the optimal form of bulk transportation over long distances, the end-points of this "long distance" must be more strictly defined in terms of the efficiency of the movement rather than simply in terms of the mode of transport. The fact that grain can be loaded into a car on a given branch line and shipped all the way to export position is not a sufficient reason to do so unless the movement is also efficient. If the load has to be moved on a high cost branch line operation through one or more yards and/or in a box car or half loaded hopper then rail is no longer the most efficient mode of transport, at least with regard to the segment in question. In this case, society's resources could be better employed if the branch line in question was abandoned and replaced by road haulage.

Increased road haulage might also be avoided to the extent that farmers, affected by abandonment, can band together and purchase 40 ton semis for hauling grain. A 1982 study by Trimac shows that a 40 ton truck costs just over twice what a 10 ton truck would cost while providing 4 times the capacity. While pooling is not a new concept, more work on this topic could provide a better indication of the level of utilization which would be

required to make operation of a semi a feasible and economic alternative to the 10 ton truck. Additional analysis of the for-hire trucking industry might also be required to determine if widespread producer ownership of semis would have any negative impacts and, if so, whether steps could be taken to alleviate these problems.

Any additional costs arising from increased road haulage should be borne by the producer unless actual hardship could be clearly identified. Any other treatment would be unfair to those who have already been affected by previous branch line abandonments and have shouldered any additional costs which arose. If a decision was made to start subsidizing costs of road haulage, claims could legitimately be made from anyone who has been affected in the past. Moreover, any subsidization scheme would have to be administered and those costs could largely erase the savings which arise initially from branch line abandonment. Nonetheless, if the full amount of the rate reductions arising from a decrease in eligible costs were passed back to producers, some relief could be afforded to those affected by abandonment and cost increases related to increased road haulage might be largely offset as shown in Chapter 3. In addition, elevator companies might find it desirable to offer incentives to more distant producers in an attempt to more fully utilize elevator capacity. In this way, elevator companies, by sharing the efficiency gains of increased throughput, could enhance their financial positions while at the same time helping to offset the additional hauling costs faced by distant producers. Finally, the railways have suggested that perhaps part of the savings associated with abandonments could be redistributed locally through rate reductions rather than through a government subsidy mechanism over some pre-specified transition period during

which targetted branch lines would be abandoned. Additional research in this area could provide valuable information concerning levels of rate reductions which might be possible so this data could be used in conjunction with trucking costs to get a clearer indication of the impact on producers.

Finally, branch line rehabilitation, as a rule, is unlikely to be a feasible alternative to road transport for any lines which have either been identified as having high average costs of operation or are in need of upgrading to meet a 250,000 lb. carrying capacity. While the railways cannot claim Government expenditures as an element in their costs of operation, rehabilitation represents, nonetheless, a claim on Federal resources which would be better expended in areas which would provide a larger benefit. Rehabilitation should only be undertaken if feasible alternatives do not exist and only if the expenditure provides for the movement of hoppers loaded to at least the 250,000 gross weight level recommended earlier in this report. Any lesser capacity would prove self-defeating and a waste of resources.

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APPENDIX I: Abandonments Since July 15, 1981

1981 Carlton (CN) Laird (M28.2) - Carlton (M35.9)

Corning (CN) Corning (M15.0) - Handsworth (M22.3)

Gravelbourg (CN) Tyson (M108.4) - Neidpath (M119.5)

Meskanaw (CN) Thatch (M1.9) - Meskanaw (M20.4)

Alberta Central (CP) Forth (M0.0) - Renalto (M25.0)

Coronado (CN) Lindbergh (M151.8) - Heinsburg (M160.0)

Langdon (CP) Carbon (M58.3) - Kneehill (M79.1)

Strathmore (CP) Hamaka (M9.7) - Strathmore (M19.0)

Total Mileage 107.9

1982 Inwood (CN) Fisher Branch (72.0) - Hodgson (M80.9)

Ste Rose (CN) Ste Rose du Lac (M11.7) - Rorketon (M37.1)

Amulet (CP) Crane Valley (M38.6) - Cardross (M45.8)

Asquith (CP) Urban (M0.0) - Arelee (M17.0)

Asquith (CP) Arelee (M17.0) - Sonningdale (M29.2)

Melfort (CP) Dent (M83.5) - Gronlid (M101.8)

Lacombe (CP) Halkirk (M0.0) - Cordel (M13.8)

Strathmore (CP) Strathmore (M19.0) - Langdon (M33.6)

Total Mileage 117.4

1983 Flin Flon (CN) 87.36 - 87.63

Lyleton (CP) Waskada (M17.6) - Dalny (M22.4)

Wawanesa (CN) Wawanesa (M14.6) - M&B Jct. (M36.8)

Winnipegosis (CN) Fork River (M10.9) - Winnipegosis (M20.8)

Bodo (CN) Cactus Lake (M40.3) - Bodo (M51.5)

Cudworth (CN) St Louis (M86.4) - Red Deer Hill (M103.3)

Kelfield (CP) Brass (M0.0) - Handel (M18.6)

Kelfield (CP) Handel (M18.6) - Kelfield (M28.5)

Melfort (CP) Lac Vert (M56.2) - Keddy (M81.6)

Endiang (CN) Endiang Jct. (M1.1) - Byemoor (M34.6)

Sheerness (CN) Sheerness (M13.0) - Cessford (M46.8)

Total Mileage 186.5

1984 Oakland (CN) Oakland (M10.0) - Amaranth (M53.4)

Dodsland (CN) Smiley (M79.2) - Dewar Lake (M86.6)

Matador (CP) Gunworth (M0.0) - Wartime (M7.4)

McMorran (CP) Milden (M0.0) - Gunworth (M30.5)

Pennant (CP) Hazlet (M19.4) - Verlo (M25.1)

Total Mileage 94.4

1985 Oakland (CN) Delta Jct. (M1.0) - Oakland (M10.0)

Gravelbourg (CN) Claybank (M7.9) - Mossbank (M47.3)

Total Mileage 48.4

1986 Inwood (CN) Grosse Isle (M0.5) - Fisher Branch (M72.0)

Amiens (CN) Shell Lake (M28.4) - Spiritwood (M49.1)

Avonlea (CN) Parry (M29.8) - Avonlea (M51.5)

Furness (CP) Epping (M0.0) - Paradise Valley (M19.5)

Total Mileage 133.4

Lines to be Abandoned Upon

Construction of Connection to Other Subdivisions

Neepawa (CN) Neepawa (M33.6) - Rossburn Jct. (M37.4)

Rossburn (CN) Rossburn Jct. (M0.0) - Bethany (M11.9)

Central Butte (CN) Moose Jaw Jct. (M39.4) - Mawer (M85.0)

Colonsay (CP) Amazon (M75.2) - Colonsay (M108.5)

Dodsland (CN) Biggar (M0.0) - Dodsland (M46.7)

Preeceville (CN) Preeceville (M72.7) - Kelvington (M113.6)

Rhein (CN) Ross Jct. (M0.0) - Hamton (M13.0)

Total Mileage 195.2

APPENDIX II

1984 Grain Handlings for Elevators

Loading 0-50, 51-100 and 101-150 Carloads

STATIONS ON GRAIN DEPENDENT BRANCH LINES SHIPPING 50 CARS OR LESS IN 1984

Station	Subdivision	Province	Railway	Number Of Cars
Altona	Gretna	Man	CP	11
Ardmore	Bonnyville	Alta	CN	3
Beaufield	Dodsland	Sask	CN	33
Canopus	Colony	Sask	CP	25
Cavalier	Turtleford	Sask	CN	42
Cowan	Cowan	Man	CN	4
Deerwood	Miami	Man	CN	17
Dodsland	Kerrobert	Sask	CP	11
Fleet	Lacombe	Alta	CP	8
Froude	Kisbey	Sask	CP	44
Gunton	Arborg	Man	CP	21
Hamton	Rhein	Sask	CN	3
Haywood	Glenboro	Man	CP	9
Jenner	Bassano	Alta	CP	30
Judson	Stirling	Alta	CP	9
Kendal	Glenavon	Sask	CN	32
Linden	Acme	Alta	CP	22
Lone Rock	Lloydminster	Sask	CP	1
Manola	Barrhead	Alta	CN	5
Maxstone	Fife Lake	Sask	CP	37
Moose Jaw	Avonlea	Sask	CN	2
Moose Range	Brooksby	Sask	CN	10
Morris	La Rivière	Man	CP	3
Myrtle	Miami	Man	CN	43
Naisberry	Tisdale	Sask	CN	2
Newstead	Glenboro	Man	CP	15
Prince Altaert	Prince Altaert	Sask	CP	6
Renwer	Cowan	Man	CN	6
Runciman	Tisdale	Sask	CP	8
St Michael	Willingdon	Alta	CP	3
Shouldice	Lomond	Alta	CP	15
Stavely	MacLeod	Alta	CP	40
Stornoway	Rhein	Sask	CN	3
Welling	Cardston	Alta	CP	9
Whittome	Brooksby	Sask	CN	29

Source: WGTA Traffic Reporting System, 1984.

STATIONS ON GRAIN DEPENDENT BRANCH LINES SHIPPING BETWEEN 51 AND 100 CARS IN 1984

Station	Subdivision	Province	Railway	Number Of Cars
Big Beaver	Fife Lake	Sask	CP	93
Big River	Big River	Sask	CN	88
Carlea	Brooksby	Sask	CN	92
Carman	Carman	Sask	CN	79
Centennial Siding	Winnipeg Beach	Man	CP	88
Conrad	Stirling	Alta	CP	64
Duperow	Dodsland	Sask	CN	96
Flintoft	Wood Mountain	Sask	CP	89
Forget	Kisbey	Sask	CP	78
Griffin	Kisbey	Sask	CP	60
Hardy	Bengough	Sask	CN	83
Harrowby	Russell	Man	CP	82
Herronton	Lomond	Alta	CP	68
Heward	Tyvan	Sask	CP	88
Iddlesleigh	Bassano	Alta	CP	85
Kisbey	Kisbey	Sask	CP	69
Mannyberries	Stirling	Alta	CP	75
Mallaig	Bonnyville	Alta	CN	55
Moose Jaw	Avonlea	Sask	CN	63
Moss Bank	Gravelbourg	Sask	CN	92
Napinka	Estevan	Man	CP	51
Pambrun	Vanguard	Sask	CP	81
Pine River	Cowan	Man	CN	100
Readlyn	Assiniboia	Sask	CP	85
South Fork	Altawan	Sask	CP	58
Streamstown	Willingdon	Alta	CP	56
Therien	Bonnyville	Alta	CN	58
Vista	Rossburn	Man	CN	91

Source: WGTA Traffic Reporting System, 1984.

STATIONS ON GRAIN DEPENDENT BRANCH LINES
SHIPPING BETWEEN 101 AND 150 CARS IN 1984

Station	Subdivision	Province	Railway	Number Of Cars
Arcola	Arcola	Sask	CP	116
Ardath	Conquest	Sask	CN	145
Beiseker	Langdon	Alta	CP	141
Blumenhof	Vanguard	Sask	CP	115
Botha	Lacombe	Alta	CP	149
Broad Valley	Inwood	Man	CN	124
Verlo	Pennant	Sask	CP	105
Clive	Lacombe	Man	CP	136
Duchess	Bassano	Alta	CP	145
Ferland	Wood Mountain	Sask	CP	147
Fosston	Tisdale	Sask	CP	142
Gimli	Winnipeg Beach	Man	CP	128
Gladmar	Bromhead	Sask	CP	117
Grayburn	Central Butte	Sask	CN	121
Harptree	Bengough	Sask	CN	140
Huntoon	Lewvan	Sask	CN	113
Inchkeith	Cromer	Sask	CN	123
Killdeer	Colony	Sask	CP	121
Lowe Farm	Miami	Man	CN	138
Meyronne	Shaunavon	Sask	CP	149
Morinville	Athabasca	Alta	CN	109
Nut Mountain	Preeceville	Sask	CN	143
Oakland	Oakland	Man	CN	117
Oungre	Bromhead	Sask	CP	130
Redwater	Coronado	Alta	CN	133
Rivercourse	Furness	Sask	CP	109
Rosemary	Bassano	Alta	CP	137
Roundhill	Demay	Alta	CN	109
St. Claire	Glenboro	Man	CP	107
Scotsguard	Shaunavon	Sask	CP	135
Scout Lake	Fife Lake	Sask	CP	126
Springwater	Dodsland	Sask	CN	116
Tantallon	Neudorf	Sask	CP	142
Travers	Lomond	Alta	CP	109
Wostok	Willingdon	Alta	CP	121

Source: WGTA Traffic Reporting System, 1984.

STATIONS ON NON-GRAIN DEPENDENT BRANCH LINES SHIPPING 50 CARS OR LESS IN 1984

Station	Subdivision	Province	Railway	Number Of Cars
Adams	Central Butte	Sask	CN	36
Ardenode	Drumheller	Alta	CN	8
Bain Tree	Drumheller	Alta	CN	7
Balcarres	Bulyea	Sask	CP	3
Bienfait	Estevan	Sask	CP	1
Breton	Hoadley	Alta	CP	19
Brocket	Crowsnest	Alta	CP	38
Burton Lake	Prince Albert	Sask	CP	8
Calahoo	Sangudo	Alta	CN	2
Campbell Park	Westlock	Alta	CN	1
Chigwell	Lacombe	Alta	CP	2
Eriksdale	Oak Point	Man	CN	18
Faulkner	Steep Rock	Man	CN	3
Forshee	Hoadley	Sask	CP	6
Grahamdale	Oak Point	Man	CN	2
Kuusamo	Brazeau	Alta	CN	16
Norfolk	Drumheller	Alta	CN	9
Onoway	Sangudo	Alta	CN	19
Pearce	Crowsnest	Alta	CP	1
Pym	Rosetown	Sask	CN	17
St. Martin	Oak Point	Man	CN	17
Shilo	Carberry	Sask	CN	30
Woodnorth	Cromer	Man	CN	2

Source: WGTA Traffic Reporting System, 1984.

STATIONS ON NON-GRAIN DEPENDENT BRANCH LINES
SHIPPING BETWEEN 51 AND 100 CARS IN 1984

Station	Subdivision	Province	Railway	Number Of Cars
Alix	Three Hills	Alta	CN	97
Battrum	Empress	Sask	CP	73
Beynon	Drumheller	Alta	CN	53
Buford	Breton	Alta	CP	66
Glasnevin	Assiniboia	Sask	CP	100
Horizon	Assiniboia	Sask	CP	85
Horsham	Burstall	Sask	CP	58
Khedive	Assiniboia	Sask	CP	94
Kincastle	Taber	Alta	CP	94
Lanfine	Oyen	Alta	CN	64
Leslieville	Brazeau	Alta	CN	96
Longburn	Oakland	Man	CN	56
Pincher	Crowsnest	Alta	CP	94
Red Deer	Brazeau	Alta	CN	69
St. Altaert	Sangudo	Alta	CN	91
Sunnybrook	Breton	Alta	CP	57
Tees	Lacombe	Alta	CP	73
Thorsby	Breton	Alta	CP	96

Source: WGTA Traffic Reporting System, 1984.

STATIONS ON NON-GRAIN DEPENDENT BRANCH LINES
SHIPPING BETWEEN 101 AND 150 CARS IN 1984

Station	Subdivision	Province	Railway	Number Of Cars
Amaranth	Oakland	Man	CN	149
Burstall	Burstall	Sask	CP	101
Clive	Lacombe	Alta	CP	135
Cranford	Taber	Alta	CP	139
Haynes	Brazeau	Alta	CN	130
Langruth	Oakland	Man	CN	109
Lemsford	Empress	Sask	CP	114
Makepiece	Irricana	Alta	CP	125
Moosehorn	Oak Point	Man	CN	119
Redland	Drumheller	Alta	CN	119
Richdale	Oyen	Alta	CN	116
Sangudo	Sangudo	Alta	CN	135
Spring Valley	Gravelbourg	Sask	CN	123
Trossachs	Assiniboia	Sask	CP	118

Source: WGTA Traffic Reporting System, 1984.

APPENDIX III: Carload Weights on Grain Dependent Branch Lines

Traffic Density

Although not used in the preceeding analysis, some interesting data on the average weights of carloads originating on grain dependent branch lines were found in the 1984 WGTA data base which shows that CN shipped 114,966 carloads containing 7,186,424 tonnes of grain. Comparable figures for CP were 107,379 carloads and 7,631,848 tonnes. The resulting average weights per carload were 62.5 tonnes and 71.1 tonnes for CN and CP respectively.

CN's grain dependent branch lines carried relatively low tonnages on a per car basis. For three branch lines, the average carload weighed 53 tonnes. An additional sixteen lines had average loads of 54 tonnes. In total, these lines represented 34% of CN's grain dependent network and, assuming a fully loaded hopper car carries about 93 tonnes, every five carloads on these lines could be handled by only three hoppers if the lines were capable of handling full loads. Lines in the above group included: Acadia Valley, Amiens, Athabasca, Avonlea, Bengough, Big River, Blaine Lake, Central Butte, Carlton, Corning, Demay, Dodsland, Hartney, Paddockwood, Porter, Rhein, Riverhurst, Robinhood and Turtleford. Selecting 65 tonnes which represents a 70% loaded hopper as a cut-off point, 36 of CN's 56 lines had lower average loadings.

CP's branch lines carried heavier average loads and only eleven of CP's 54 lines had average car loads of less than 60 tonnes. An additional 7 lines had average car loads under 64 tonnes. In total, only 18 of CP's 54 branch lines had average car loads weighing less than 65 tonnes. The above group of lines includes: Assiniboia, Bromhead, Colonsay, Colony, Dunelm, Fife Lake, Furness, Gravelbourg, Gretna, Kisbey, Macklin, Neudorf, Reford, Russell, Shamrock, Tisdale, Wood Mountain and Winnipeg Beach.

APPENDIX IV Branch Line Costs in Cents per tonne-km

CN Notes to Schedules I and II

Schedule I: Costs and Traffic for CN Grain Dependent Branch Lines, 1984

Schedule II: Costs and Traffic for CN Branch Lines Claimed in 1981 But Not Claimed as Grain Dependent in 1984

CP Notes to Schedules III and IV

Schedule III: Costs and Traffic for CP Grain Dependent Branch Lines, 1984

Schedule IV: Costs and Traffic for CP Branch Lines Claimed in 1981 but not Claimed as Grain Dependent in 1984

CN Notes to Schedules I and II

Attached as Schedule I is a listing of 1984 CN grain dependent branch lines which provides: the Subdivision name; the end-points of the grain dependent portion of the Subdivision; and, the cost, traffic and cost per tonne - km on the segment in question. The Subdivision and cost data was taken from the RTC Costing Review while the traffic data was developed using originating and terminating revenue ton miles provided by CN in conjunction with RTC approved originating and terminating grain tonnage and the 1984 805C Report of CN freight train movements. These latter two sources were used to develop estimates of bridge traffic moving over other GDBL's. The resulting ton-mile estimate was then transformed to a tonne-km measure.

In addition, Schedule II provides a listing of segments claimed in 1981 which are not considered to be grain dependent branch lines in 1985/86. Data in this table was derived from branch line payments made under Sections 256 and 258 of the Railway Act and GTM data from the On-Line data underlying branch line submissions. A quick perusal of this list reveals that 13 segments have been abandoned (A) since 1981. These segments had a total cost of $1.3 million and carried a total of 3,878 MGTM's of traffic for an average cost of 33.52¢/GTM (or 18.90¢/tonne-km). When compared to the Crow Rate of 0.5¢/GTM, it can be seen that there is a high correlation between high unit cost and abandonment.

An additional 4 segments were determined to be not grain dependent (NGD) because less than 60% of their traffic was grain and 3 others were eliminated as not being branch lines (NBL) because they were required for

operational reasons. Two branch line failed the revenue test for grain dependent status and, of the remaining seven, one passed the revenue test but was rejected by the Commission while the others were not claimed since they didn't handle any traffic in the year in question. Finally, the Gravelbourg Subdivision which is currently operated by CP is also included in this list. Again, the most expensive segments of this subdivision have been abandoned and are therefore consistent with the current proposal to abandon segments exhibiting high average output costs.

It should be mentioned, however, that wide fluctuations in costs and traffic can occur from year to year so estimates should be viewed as being only broadly demonstrative of the ongoing costs of operating the branch line in question.

SCHEDULE I

COSTS AND TRAFFIC FOR CN GRAIN DEPENDENT BRANCH LINES, 1984

Subdivision	Between	Total Line-Related Variable Cost ($ Millions)	MRTM (tonnes)	¢/tonne-km
Acadia Valley	Eyre Jct (M0.0) - Acadia Valley (M23.7)	0.208	959.2	13.47
Alliance	Alliance Jct. (M0.0) - Alliance (M59.2)	1.109	7567.7	9.11
Amiens	Shell Lake (M28.4) - England (M75.0)	0.420	1286.5	20.29
Arborfield	Crane (M0.0) - Arborfield (M19.4)	0.245	2158.4	7.05
Athabasca	Morin Jct. (M20.2) - Athabasca (M93.1)	1.194	4003.7	18.53
Avonlea[1]	Parry (M29.8) - Moose Jaw (M83.8)	0.647	3496.6	11.50
Barrhead	Carley Jct. (M0.0) - Barrhead (M26.1)	0.275	2933.7	5.82
Battleford	Battleford (M0.0) - Battleford Jct. (M7.8)	0.087	449.9	12.02
Bengough	Bengough Jct. (M0.0) - Willowbunch (M71.5)	1.865	3543.2	32.71
Big River	Big River Jct. (M0.0) - Big River (M56.5)	0.717	2342.9	19.02
Blaine Lake	Prince Albert Jct. (M0.0) - Denholme (M116.5)	1.433	21835.9	4.08
Bodo	Unity (M0.0) - Cactus Lake (M40.3)	0.393	1922.3	12.70
Bolney	Spruce Lake Jct. (M0.0) - Paradise Hill (M15.7)	0.105	693.8	9.40
Bonnyville	Abilene Jct. (M0.0) - Grand Centre (M61.1)	1.601	7651.1	13.00
Brooksby	Naisberry Jct. (M0.0) - Carrot River (M51.1)	0.697	7830.6	5.53
Carlton	Dalmeny (M0.0) - Laird (M28.2)	0.441	685.4	39.98
Carman	Carman Jct. (M0.0) - Graysville (M50.9)	0.556	4943.2	6.99
Central Butte[2]	Moose Jaw Jct. (M39.2) - Central Butte (M92.5)	0.565	4220.7	8.32
Chelan	Reserve (M0.0) - Crooked River (M60.1)	2.608	2406.0	67.35
Conquest	Conrose Jct. (M0.0) - Beechy (M94.3)	0.765	46472.6	1.02
Corning	Peebles (M0.0) - Corning (M15.0)	0.462	287.6	99.82
Coronado	St. Paul Jct. (M0.0) - Elk Point (M139.6)	3.037	22358.9	8.44
Cowan	North Jct. (M0.0) - Swan River (M98.5)	1.559	23689.0	4.09
Cromer	Maryfield (M75.8) - Kipling (M128.6)	0.845	4510.0	11.64
Cudworth	Meacham (M23.6) - St. Louis (M86.4)	0.855	6956.0	7.64
Demay	Camrose Jct. (M0.0) - Ryley (M25.0)	0.178	53.3	207.51
Dodsland[3]	Biggar (M0.0) - Smiley (M79.2)	0.754	5822.2	8.05

Elrose	Conquest Jct. (M0.0) - Glidden (M104.8)	1.220	38827.2	1.95
Erwood	Swan River (M0.0) - Birch River (M23.0)	0.448	1596.3	17.44
Glenavon	Kipling (M0.0) - McCallum (M87.5)	1.243	18739.2	4.12
Hartney	Belmont (M0.0) - Elgin (M42.2)	0.508	3020.7	10.45
Herchmer	Gillam (M330.3) - Churchill (M509.9)	3.964	90148.6	2.73
Inwood	Grosse Isle (M0.5) - Fisher Branch (M72.0)	0.392	1816.0	13.41
Lewvan	Minard Jct. (M0.0) - Whitmore (M115.5)	2.434	15948.6	9.48
Mantario	Mantario Jct. (M0.0) - Glidden (M43.8)	0.424	4601.3	5.73
Matador[4]	Matador Jct. (M0.0) - Kyle (M29.7)	0.236	2579.1	5.69
Miami	Morris (M0.0) - Belmont (M102.2)	1.325	23810.6	3.46
Neepawa	Neepawa (M0.0) - Rossburn Jct. (M5.3)	0.150	1004.1	9.28
Oakland[5]	Delta Jct. (M1.0) - Oakland (M10.0)	0.085	54.4	97.09
Paddockwood	Whitestar (M1.7) - Paddockwood (M23.9)	0.251	735.5	21.21
Porter	Oban Jct. (M0.0) - Cando (M18.0)	0.226	301.9	46.52
Preeceville	Thunderhill Jct. (M0.0) - Sturgis Jct. (M65.3)	0.706	9696.0	4.52
Preeceville[6]	Lilian (M67.4) - Kelvington (M113.6)	0.625	4247.0	9.14
Rhein[7]	Ross Jct. (M0.0) - MacNutt (M53.8)	0.769	3294.3	14.50
Riverhurst	Central Butte (M0.0) - Riverhurst (M18.0)	0.191	705.4	16.82
Robinhood	Speers Jct. (M0.0) - Glaslyn (M69.6)	0.564	10633.3	3.30
Rossburn[8]	Rossburn Jct. (M0.0) - Russell (M104.3)	1.646	11614.0	8.81
St. Brieux	St. Brieux Jct. (M0.0) - Humboldt Jct. (M54.1)	0.550	36196.8	0.94
Ste-Rose	Ochre River (M0.0) - Ste. Rose du Lac (M11.7)	0.142	232.8	37.90
Smoky	Winagami (M263.5) - Spirit River (M357.2)	2.120	26130.9	5.04
Stettler	Ferlow Jct. (M0.0) - Dinosaur (M108.0)	1.183	9032.8	8.14
Tisdale	Hudson Bay (M0.0) - Prince Albert (M161.2)	4.336	61700.0	4.37
Turtleford	North Battleford (M0.0) - St. Walburg (M77.7)	0.923	14524.5	3.95
Weyburn	Talmage (M0.0) - Bengough Jct. (M39.7)	0.450	4765.4	5.87
White Bear	Eston Jct. (M0.0) - Lacadena (M24.5)	0.218	1329.2	10.19
Winnipegosis[9]	Sifton Jct. (M0.0) - Fork River (M10.9)	0.095	185.2	31.87
TOTAL		51.045	588191.5	5.39

Source: RTC - Cost Data from Report on the variable costs and revenues of the railway companies for the movement of grain in 1984 under the Western Grain Transportation Act

- Traffic Data Supplied by CN for on-line originating and terminating traffic.

- Bridge Traffic calculated using RTC approved grain tonnage originating and terminating on branch lines plus estimated share of total tonnage in conjunction with CN's 805C Report on Freight Train Statistics to provide routing information.

Footnotes

(1) Parry - Avonlea to be abandoned Jan. 1, 1986

(2) Moose Jaw - Mawer to be abandoned Aug. 31, 1987 contingent upon construction of connection to Outlook Subdivision (CP).

(3) Biggar - Dodsland to be abandoned after construction of connection to CP's Kerrobert Subdivision. Smiley (M79.2) to Dewar Lake (M86.6) abandoned Aug. 16, 1984.

(4) Owned by CP operated by CN.

(5) Delta Jct. to Oakland to be abandoned December 31, 1985
Oakland to Amaranth abandoned August 31, 1984.

(6) Preeceville - Kelvington to be abandoned Aug. 31, 1987 upon construction of connection to CP's Tisdale Subdivision.

(7) Ross Jct. - Hamton to be abandoned Aug. 31, 1987 upon construction of connection to CN's Yorkton Sub. Wroxton - MacNutt shown as mileage 32.4 to 49.0 of the Tonkin Subdivision in 1981.

(8) Rossburn Jct. - Bethany to be abandoned upon construction of connection to CP Minnedosa.

(9) Fork River (M10.9) to Winnipegosis (M20.8) abandoned April 14, 1983.

SCHEDULE II

COSTS AND TRAFFIC FOR CN BRANCH
LINES CLAIMED IN 1981 BUT NOT CLAIMED AS GRAIN
DEPENDENT IN 1984

Subdivision	Between	Cost $	GTM's (,000's)	¢/tonne-km	Status
Bodo	Cactus Lake (M40.3) - Bodo (M51.5)	158,549	221	49.14	A
Carlton	Laird (M28.2) - Carlton (M35.9)	41,000	61	24.42	A
Corning	Corning (M15.0) - Hansworth (M22.3)	32,855	86	26.16	A
Coronado	Lindbergh (M151.8) - Heinsburg (M160.0)	92,995	0		A
Cudworth	St. Louis (M86.4) - Red Deer (M103.3)	106,161	61	119.20	A
	Red Deer H (M103.3) - Cudworth J (M108.0)	32,706	0		NC
Drumheller	Hanna (M0.0) - Sarcee (M130.0)	2,719,161	33,954	5.49	NBL
Endiang	Endiang Jct (M1.1) - Byemoor (M34.6)	276,863	1,836	10.33	A
Erwood	Baden (M50.9) - Hudson Bay (M100.0)	468,083	161	290.73	NGD
Grande Prairie	Rycroft (M0.0) - Dawson Creek (M138.0)	4,126,854	76,677	3.69	R
Gravelbourg	Gravelbourg Jct (M0.0) - Claybank (M7.9)	49,669	64	53.16	A
	Claybank (M7.9) - Mossbank (M47.3)	207,701	126	112.91	A
	Mossbank (M47.3) - Gravelbourg (M79.2)	451,367	5,319	5.82	CP
	Gravelbourg (M79.2) - Hodgeville (M104.6)	204,283	394	35.51	CP
	Hodgeville (M104.6) - Tyson (M108.4)	21,435	0		CP
	Tyson (M108.4) - Neidpath (M119.6)	61,942	242	17.53	A
		996,397	6,145	11.11	
Inwood	Fisher Br (M72.0) - Hodgson (M80.9)	24,237	1	166.24	A
Lac LaBiche-WW	Banko Jct (M0.0) - Waterways (M285.5)	7,294,107	172,279	2.90	NGD
Lampman	Maryfield (M0.0) - Estevan (M93.4)	1,536,547	37,063	2.84	NGD
Langdon	Rosedale Jct (M85.5) - East Coulee (M94.3)	59,809	0		NC
Meskanaw	Melfort (M0.0) - Thatch (M1.9)	16,162	0		NC
	Thatch (M1.9) - Meskanaw (M20.4)	86,248	362	16.32	A
Northgate	Northgate (M0.0) - Lampman (M39.4)	470,647	1,276	25.26	NGD
Oyen	Kindersley (M0.0) - Hanna (M136.4)	3,797,396	33,053	7.87	NBL
Peace River	Roma Jct (M60.6) - Hines Creek (M113.4)	1,097,332	17,115	4.39	NC
Ridgeville	Ridgeville (M60.9) - Fredenstha (M64.0)	21,934	11	136.58	NC
Ridgeville	Fredenstha (M64.0) - Emerson (M69.9)	13,671	0		NC

SCHEDULE II (cont'd.)

Subdivision	Between	Cost $	GTM's (,000's)	¢/tonne-km	Status
Rosetown	Roskin Jct (M0.0) - Kindersley (M121.3)	1,584,844	49,069	2.21	NBL
Sheerness	Batter Jct (M0.0) - Sheerness (M13.0)	185,276	0		NC
Ste Rose	Ste Rose (M11.7) - Rorketon (M37.1)	66,525	0		A
Wawanesa	Wawanesa (M14.6) - M&B Jct (M36.8)	115,191	818	9.64	A

Source: Same as Schedule 1 plus RTC File 10211 Vol. 2

CP Notes to Schedules III and IV

Cost statistics for CP were derived using the same procedure applied to the CN cost data except that CP provided total on-line traffic so independent estimates of bridge traffic were not required. A listing of branch lines declared grain dependent for the crop year 1985/86 and their associated cents per tonne-kilometre can be found in Schedule III.

A listing of line segments claimed in 1981 which are not declared grain dependent for the crop year 1985/86 can be found in Schedule IV. Of the 10 line segments in this group, 6 were abandoned, 3 were not claimed and 1 was transfered to CN (CN). The average cost for the line segments that were abandoned was 9.88¢/tonne-km. This cost figure is less significant than the comparable figure for CN and does not seem to indicate a high correlation between high unit cost and the decision to abandon a line segment.

SCHEDULE III

COSTS AND TRAFFIC FOR CP GRAIN DEPENDENT BRANCH LINES, 1984

Subdivision	Between	Total Line-Related Variable Cost ($ Millions)	MRTM (tonnes)	¢/tonne-km
Acme	Cosway (M0.0) - Winborne (M27.9)	0.483	851.8	35.23
Altawan	Shaunavon (M0.0) - Manyberries (M122.1)	1.052	14849.3	4.40
Amulet	Ormiston (M30.9) - Crane Valley (M38.6)	0.119	137.7	53.70
Arborg	Rugby (M5.4) - Arborg (M75.1)	0.542	4612.3	7.30
Arcola	Schwitzer (M0.0) - Arcola (M96.7)	1.171	11777.1	6.18
Assiniboia	Amulet (M46.0) - Assiniboia (M111.1)	1.200	1103.3	67.58
Bassano	Empress (M0.0) - Bassano (M118.4)	2.078	6735.4	19.17
Bromhead[1]	Estevan (M0.0) - Minton (M79.1)	0.762	5972.4	7.93
Bulyea	Neudorf (M0.0) - Bulyea (M86.4)	0.649	13094.3	3.08
Burstall	Schuler Spur (6.8 Miles)	0.119	194.4	38.03
Cardston	Stirling (M0.0) - Cardston (M46.8)	0.839	2352.1	22.17
Colonsay[2]	Dilke (M21.3) - Colonsay (M108.5)	0.726	10226.0	4.41
Colony[3]	Rockglen (M0.0) - Killdeer (M24.6)	0.147	197.4	46.27
Coronation	Kerrobert (M1.5) - Coronation (M116.5)	1.732	8745.7	12.31
Dunelm	Player (M0.0) - Simmie (M25.2)	0.275	698.7	24.46
Empress	Leader (M88.2) - Empress (M111.8)	0.666	0	00

SCHEDULE III (cont'd.)

Subdivision	Between	Total Line-Related Variable Cost ($ Millions)	MRTM (tonnes)	¢/tonne-km
Expanse	Curle (M0.0) - Assiniboia (M64.6)	0.455	62728.8	0.45
Fife Lake	Assiniboia (M0.0) - Big Beaver (79.8)	0.916	5337.5	10.66
Furness[4]	Epping (M0.0) - Paradise Valley (M19.5)	0.179	472.1	23.56
Glenboro[5]	Murray Park (M6.0) - Souris (M145.0)	1.910	21873.6	5.43
Gravelbourg[6]	Mossbank Jct. (M0.0) - Tyson (M57.3)	0.549	4392.6	7.77
Gretna	Resenfeld (M0.0) - Gretna (M14.1)	0.144	1203.1	7.44
Hatton	Hatton (M0.0) - Golden Prairie (M17.8)	0.114	684.1	10.36
Kerrobert	Outlook (M0.0) - Kerrobert (M102.5)	1.131	13133.6	5.35
Kisbey	Arcola (M0.0) - Weyburn (M61.7)	0.441	221.1	123.94
Lac Du Bonnet	Birds Hill (M6.0) - Lac Du Bonnet (M65.7)	0.660	804.3	50.99
Lacombe	Coronation (M0.0) - Nevis (M70.8)	1.352	19777.0	4.25
Langdon/Strathmore[7]	Langdon (M0.0) - Carbon (M58.3)	1.053		15.32
	Langdon (M33.6) - Sheppard (M45.1)	0.463	6149.0	
La Riviere	Fortress (M11.5) - La Riviere (M111.0)	3.379	28861.3	7.27
Lloydminster	Wilke (M0.0) - Lloydminster (M104.6)	1.434	24456.3	3.64
Lomond[8]	Eltham (M0.0) - Hays (M112.3)	1.816	19359.5	5.83
Lyleton	Deloraine (M0.0) - Waskada (M17.6)	0.143	729.0	12.19
Macklin	Kerrobert (M0.0) - Macklin (M46.4)	0.885	8647.9	6.36
MacLeod[9]	Aldersyde (M31.5) - Ft. MacLeod (M105.3)	1.331	3548.2	23.31
Melfort	Lanigan (M0.0) - Lac Vert (M56.2)	1.221	7992.7	9.49
Napinka	La Riviere (M0.0) - Napinka (M108.5)	1.370	21741.9	3.92
Neudorf	Rocanville (M0.0) - Neudorf (M126.2)	2.083	12142.0	10.66
Notukeu	Notukeu (M0.0) - Val Marie (M96.9)	1.379	10324.2	8.30
Outlook	Moose Jaw (M2.3) - Outlook (M120.3)	1.199	51630.6	1.44
Pennant	Wickett (M0.0) - Hazlett (M19.4)	0.188	977.6	11.95
Reford	Kerrobert (M0.0) - Wilkie (M42.8)	0.448	1148.5	24.24
Russell	Binscarth (M0.0) - Inglis (M23.9)	0.526	826.5	39.54
Shamrock	Archive (M0.0) - Hak (M103.4)	0.822	6815.4	7.49
Shaunavon	Assiniboia (M0.0) - Shaunavon (M118.2)	2.371	55275.6	2.66
Stirling	Manyberries (M0.0) - Stirling (M84.5)	1.282	9576.7	8.32

SCHEDULE III (cont'd.)

Subdivision	Between	Total Line-Related Variable Cost ($ Millions)	MRTM (tonnes)	¢/tonne-km
Strathmore[10]	Langdon (M33.6) - Sheppard (M45.1)	-	-	-
Tisdale	Goudie (M0.0) - Nipawin (M131.7)	1.230	47633.9	1.61
Turin	Coalhurst (M0.0) - Turin (M27.0)	0.445	1660.5	16.65
Tyvan	Stoughton (M0.0) - Crecy (M87.2)	0.949	11587.1	5.09
Vanguard	Swift Current (M0.0) - Meyronne (M76.3)	0.686	4758.2	8.96
White Fox	Nipawin (M0.0) - Sharpe (M73.4)	1.132	4454.8	15.79
Willingdon	Lloydminster (M0.0) - Bruderheim (M144.1)	2.875	23149.2	7.72
Winnipeg Beach	Gimli (M58.0) - Riverton (M82.6)	0.265	205.0	80.32
Wood Mountain	Ogle (M0.0) - Mankota (M64.9)	0.617	4880.0	7.86
Total		52.003	580712.3	5.56

Source: Line-Related Variable Cost Data from Report on the Variable Costs and Revenues of the railway companies for the movement of grain in 1984 under the Western Grain Transportation Act, RTC March 1986.
MRTM Data Supplied by CP.

Footnotes

(1) a total of 86.1 track miles including the Tribune Spur (7.0M).

(2) Amazon (M75.7) to Colonsay (M108.5) has been authorized for abandonment contingent upon construction of a connection to CN Watrous.

(3) an order was issued November 29, 1982 to continue operation subject to a 5 year review.

(4) an order was issued February 5, 1985 to extend abandonment date to January 1, 1986.

(5) a total of 154.0 track miles including the Carman Spur (15.0M)

(6) Owned by CN operated by CP.

(7) CP's MRTM data is aggregated for the Langdon/Strathmore Sub (Shepard-Cosway) and the Langdon Sub (Cosway-Carbon) so RTC cost data is also aggregated here and one cost estimate is produced.

(8) includes the former Suffield subdivision.

(9) includes Claresholm Airport Spur (2.8M)

(10) See Footnote (6)

SCHEDULE IV

COSTS AND TRAFFIC FOR CP BRANCH LINES CLAIMED IN 1981 BUT NOT CLAIMED AS GRAIN DEPENDENT IN 1984

Subdivision	Between	Cost $	GTM (000's)	¢/tonne-KM	Status
Alberta Central	Forth (M0.0) - Benalto (M25.0)	131,332	804	11.19	A
Asquith	Urban (M0.0) - Sonningdale (M29.2)	226,829	1,053	14.75	A
Irricana	Bassano (M0.0) - Standard (M36.5)	630,434	6,923	6.24	NC
Kelfield	Brass (M0.0) - Handel (M18.6)	150,300	1,273	8.09	A
Matador	Gunworth (M0.0) - Wartime (M8.3)	369,792	3,993	6.34	A
	Wartime (M8.3) - Kyle (M38.1)	-	-	6.34	CN
McMorran	Milden (M0.0) - Gunworth (M31.0)	308,356	331	63.91	A
Meadow Lake	Tobey (M0.0) - Meadow Lake (M94.4)	1,569,545	23,100	4.65	NC
Prince Albert	Lanigan (M0.0) - Northway (M94.4)	1,485,847	6,820	14.92	NC
Wishart	Foam Lake (M0.0) - Wishart (M26.9)	175,299	1,091	11.00	A

Source: RTC File 10211 Vol. 2
: Cost Data from 1981 Final Submission Version 05B18 Cost Detail Report Online COC 13.85% 12 Mar'84.
: GTM Data from B12 Online Car Related Units BKCLIB22
: FA 1981 Box 720 Feb '84

APPENDIX V: Road and Street Kilometres and Expenditure by Province and per Capita, 1976

Schedule I: Road and Street Kilometres Classified by Type and by Province as at Dec. 31, 1976

Schedule II: Distribution of Road and Street Kilometres Classified by Type and by Province as at Dec. 31, 1976

Schedule III: Total Road and Street Kilometres Classified by Type and by Province and Distribution of Same as at Dec. 31, 1976

Schedule IV: Construction, Maintenance and Administration Expenditure on Roads and Streets per Kilometre by Province for the Year Ended Mar. 31, 1976 (000's dollars/km.)

Schedule V: Per Capita Expenditure on Construction, Maintenance and Administration for Roads and Streets, by Province for the Year Ended Mar. 31, 1976

Schedule VI: Per Capita Expenditure on Construction, Maintenance and Administration for Roads and Streets by Province and by Level of Government for the year ended Mar. 31, 1976

Schedule VII: Road and Street Kilometres per capita by Province as at Dec. 31, 1976

SCHEDULE I

ROAD AND STREET KILOMETRES CLASSIFIED BY TYPE
AND BY PROVINCE AS AT DECEMBER 31, 1976

	PROVINCES											
	NEWF.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALB.	B.C.	Y & N.T.	Canada
Municipal Jurisdiction												
Rigid Pavement	10	14	116	21	1 332	3 771	2 628	296	692	219	-	9 099
Flexible Pavement	1 363	212	1 620	2 118	21 952	45 139	1 375	3 970	16 785	12 490	107	107 131
Gravel	1 332	-	243	452	13 918	74 155	38 785	96 770	83 992	3 487	168	313 302
Earth	257	11	3	76	3 185	5 010	17 725	78 834	40 245	288	7	145 641
Other	-	6	-	8	180	124	8	55	19	37	-	437
Total Municipal	2 962	245	1 983	2 675	40 567	128 199	60 521	179 925	141 733	16 521	280	575 611
Federal and Provincial Jurisdiction												
Rigid Pavement	-	24	8	-	732	1 682	584	-	3	16	-	3 049
Flexible Pavement	4 641	3 243	9 537	9 771	32 652	17 754	8 580	16 551	10 420	17 475	120	130 744
Gravel	5 586	1 157	16 962	10 511	31 741	11 764	11 552	7 093	23 063	23 567	5 995	148 991
Earth	14	914	-	2	8 153	1 075	161	2 623	4 926	7 741	85	25 694
Other	-	-	-	-	2	179	-	-	-	-	-	181
Total Fed. and Prov.	10 241	5 338	26 507	20 284	73 280	32 454	20 877	26 267	38 412	48 799	6 200	308 659
Total Kilometres	13 203	5 583	28 490	22 959	113 847	160 653	81 398	206 192	180 145	65 320	6 480	884 270

Source: Canada Year Book 1980-81, Statistics Canada.

SCHEDULE II

DISTRIBUTION OF ROAD AND STREET KILOMETRES CLASSIFIED BY TYPE
AND BY PROVINCE AS AT DECEMBER 31, 1976

	PROVINCES											
	NEWF.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALB.	B.C.	Y & N.T.	Canada
Municipal Jurisdiction												
Rigid Pavement	.3	5.7	5.9	.8	3.3	2.9	4.3	.2	.5	1.3	-	1.6
Flexible Pavement	46.0	86.5	81.7	79.2	54.1	35.2	2.3	2.2	11.8	75.6	38.2	18.6
Gravel	45.0	-	12.3	16.9	34.3	57.8	64.1	53.8	59.3	21.1	60.0	54.4
Earth	8.7	4.5	.2	2.8	7.9	3.9	29.3	43.8	28.4	1.7	2.5	25.3
Other	-	2.5	-	.3	.4	.1	-	-	-	.2	-	.1
Total Municipal	100.0	99.2	100.1	100.0	100.0	99.9	100.0	100.0	100.0	99.9	100.7	100.0
Federal and Provincial Jurisdiction												
Rigid Pavement	-	.5	-	-	1.0	5.2	2.8	-	-	-	-	1.0
Flexible Pavement	45.3	60.8	36.0	48.2	44.6	54.7	41.1	63.0	27.1	35.8	1.9	42.4
Gravel	54.6	21.7	64.0	51.8	43.3	36.3	55.3	27.0	60.0	48.3	96.7	48.3
Earth	.1	17.1	-	-	11.1	3.3	.8	10.0	12.8	15.9	1.4	8.3
Other	-	-	-	-	-	.6	-	-	-	-	-	.1
Total Fed. and Prov.	100.0	100.1	100.0	100.0	100.0	100.1	100.0	100.0	99.9	100.0	100.0	100.1

Source: Canada Year Book 1980-81, Statistics Canada.

SCHEDULE III

TOTAL ROAD AND STREET KILOMETRES CLASSIFIED BY TYPE
AND BY PROVINCE AND DISTRIBUTION OF SAME AS AT DECEMBER 31, 1976

	PROVINCES											
	NEWF.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALB.	B.C.	Y & N.T.	Canada
Municipal Jurisdiction												
Rigid Pavement	10	38	124	21	2 064	5 453	3 212	296	695	225	-	12 148
Flexible Pavement	6 004	3 455	11 157	11 889	54 604	62 893	9 955	20 521	27 205	29 965	227	237 875
Gravel	6 918	1 157	17 205	10 963	45 659	85 919	50 337	103 863	107 055	27 054	6 163	462 293
Earth	271	925	3	78	11 338	6 085	17 886	81 457	45 171	8 029	92	171 335
Other	-	6	-	8	182	303	8	55	19	37	-	618
Total	13 203	5 583	28 490	22 959	113 847	160 653	81 398	206 192	180 145	65 320	6 480	884 270
Federal and Provincial Jurisdiction												
Rigid Pavement	.1	.7	.4	.1	1.8	3.4	4.0	.1	.4	.3	-	1.4
Flexible Pavement	45.5	61.9	39.2	51.8	48.0	39.2	12.2	10.0	15.1	45.9	3.5	26.9
Gravel	52.4	20.7	60.4	47.8	40.1	53.5	61.8	50.4	59.4	41.4	95.1	52.3
Earth	2.1	16.6	-	.3	10.0	3.8	22.0	39.5	25.1	12.3	1.4	19.4
Other	-	.1	-	-	.2	.2	-	-	-	.1	-	.1
Total	100.1	100.0	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	100.1

Source: Canada Year Book 1980-81, Statistics Canada.

SCHEDULE IV

CONSTRUCTION, MAINTENANCE AND ADMINISTRATION EXPENDITURE ON ROADS AND STREETS PER KILOMETRE BY PROVINCE FOR THE YEAR ENDED MARCH 31, 1976
(000's dollars/kilometre)

	PROVINCES											
	NEWF.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALB.	B.C.	Y & N.T.	CANADA	%
Municipal Expenditure													
Construction	11 829	489	13 689	25 041	199 435	377 508	42 571	49 703	140 040	83 283	2 271	945 859	46.7
Maintenance	13 144	1 697	16 252	20 678	260 974	418 223	49 747	76 224	136 725	81 960	3 327	1 078 951	53.3
Total Municipal	24 973	2 186	29 941	45 719	460 409	795 731	92 318	125 927	276 765	165 243	5 598	2 024 810	100.0
Kilometres	2 962	245	1 983	2 675	40 567	128 199	60 521	179 925	141 733	16 521	280	575 610	
Municipal Expenditure Per Kilometres	8.431	8.922	15.098	17.091	11.349	6.207	1.525	0.700	1.953	10.002	19.993	3.518	
Provincial and Federal Expenditure													
Construction	55 976	8 164	51 885	75 751	512 504	326 303	46 437	72 026	170 705	164 344	27 288	1 511 393	62.3
Maint. and Adm.	59 906	12 350	69 867	52 075	250 775	181 186	59 507	45 211	43 401	120 331	18 228	912 837	37.7
Total Prov. and Fed.	115 882	20 514	121 752	127 826	763 279	507 489	105 944	117 247	214 106	284 675	45 516	2 424 230	100.0
Kilometres	10 241	5 338	26 507	20 284	73 280	32 454	20 877	26 267	38 412	48 799	6 200	308 659	
Provincial and Federal Expenditure Per Kilometres	11.315	3.843	4.593	6.302	10.416	15.637	5.075	4.464	5.574	5.834	7.341	7.854	
Total Gov't Expenditure	140 855	22 700	151 693	173 545	1 223 688	1 303 220	198 262	243 174	490 871	449 918	51 114	4 449 040	
Total Kilometres	13 203	5 583	28 490	22 959	113 847	160 653	81 398	206 192	180 145	65 320	6 480	884 270	
Gov't Expenditure Per Kilometre	10.668	4.066	5.324	7.559	10.749	8.112	2.436	1.179	2.725	6.888	7.888	5.031	

Source: Canada Year Book 1980-81, Statistics Canada.

SCHEDULE V

PER CAPITA EXPENDITURE ON CONSTRUCTION, MAINTENANCE AND ADMINISTRATION FOR ROADS AND STREETS, BY PROVINCE FOR THE YEAR ENDED MARCH 31, 1976

Province	Total Expenditure (000's)	Population	Expenditure Per Capita
Newfoundland	$ 140 855	557 725	$ 253
Prince Edward Island	22 700	118 229	192
Nova Scotia	151 693	828 571	183
New Brunswick	173 545	677 250	256
Quebec	1 223 688	6 234 445	196
Ontario	1 303 220	8 264 465	158
Manitoba	198 262	1 021 506	194
Saskatchewan	243 174	921 323	264
Alberta	490 871	1 838 037	267
British Columbia	449 918	2 466 608	182
Yukon and N.W.T.	51 114	64 445	793
Canada	4 449 040	22 992 604	193

Source: Canada Year Book 1980-81, Statistics Canada.

SCHEDULE VI

PER CAPITA EXPENDITURE ON CONSTRUCTION, MAINTENANCE AND ADMINISTRATION FOR ROADS AND STREETS, BY PROVINCE AND BY LEVEL OF GOVERNMENT FOR THE YEAR ENDED MARCH 31, 1976

Province	Federal and Provincial Expenditure per Capita	Municipal Expenditure per Capita
Newfoundland	207.78	44.78
Prince Edward Island	173.50	18.50
Nova Scotia	146.90	36.10
New Brunswick	188.70	67.50
Quebec	122.40	73.80
Ontario	61.40	96.30
Manitoba	103.70	90.40
Saskatchewan	127.30	136.70
Alberta	116.50	150.60
British Columbia	115.40	67.00
Yukon and N.W.T.	706.30	86.90
Canada	105.40	88.10

SCHEDULE VII

ROAD AND STREET KILOMETRES PER CAPITA
BY PROVINCE AS AT DEC. 31, 1976

Province	Road and Street Kilometres	Population	Km/Capita
Newfoundland	13 203	557 725	.0237
Prince Edward Island	5 583	118 229	.0472
Nova Scotia	28 490	828 571	.0344
New Brunswick	22 959	677 250	.0339
Quebec	113 847	6 234 445	.0183
Ontario	160 653	8 264 465	.0194
Manitoba	81 398	1 021 506	.0797
Saskatchewan	206 192	921 323	.2238
Alberta	180 145	1 838 037	.0980
British Columbia	65 320	2 466 608	.0265
Yukon and N.W.T.	6 480	64 445	.1006
Canada	884 270	22 992 604	.0385

Source: Canada Year Book 1980-81, Statistics Canada.

Appendix VI: Maps

1) High Average Cost Segments (¢ per tonne-kilometre)

2) Low Density Stations of Grain Dependent Branch Lines (1984)

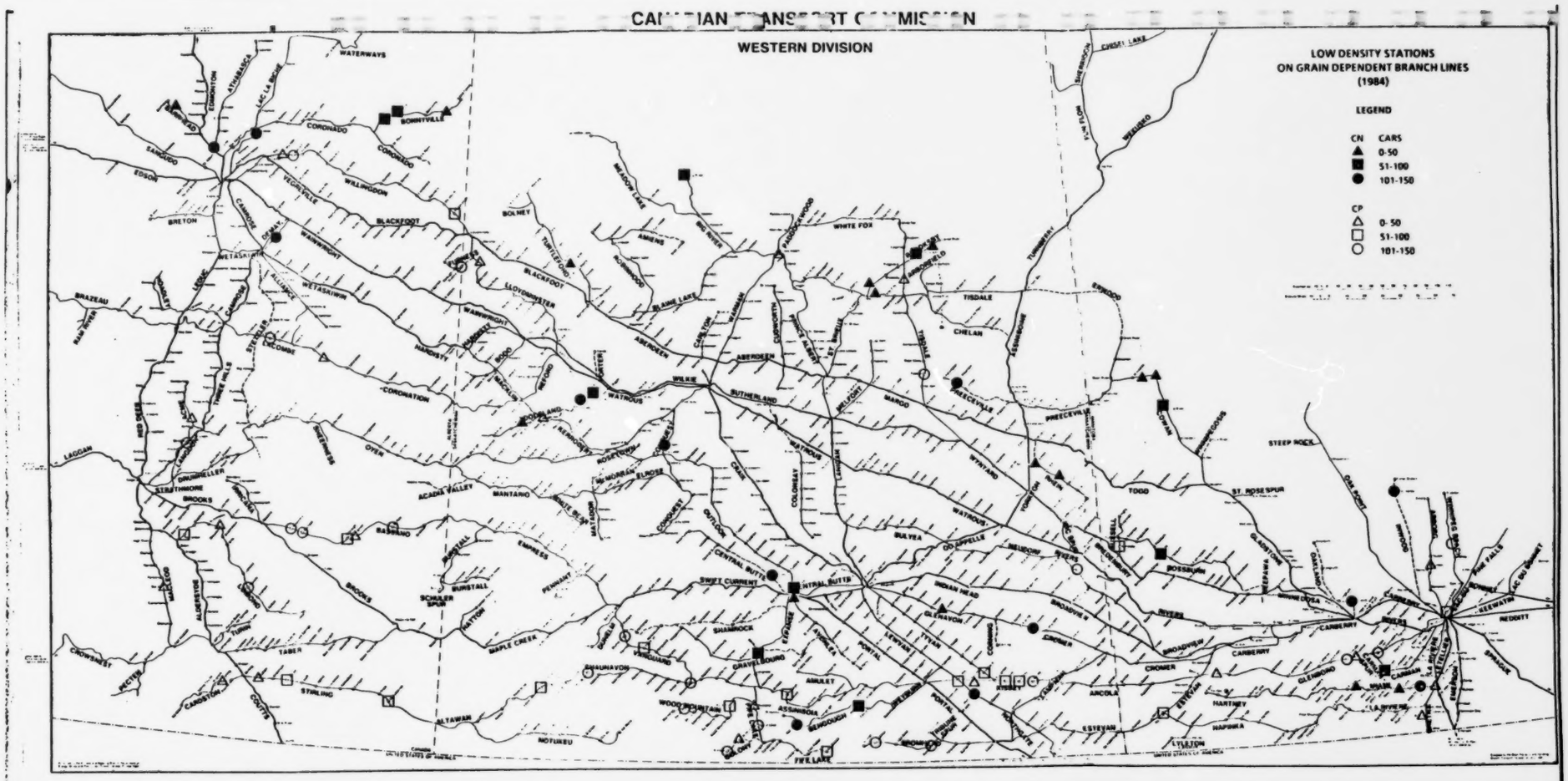
3) Low Density Segments of Grain Dependent Branch Lines

4) Track Capacity in Prairie Rail Network (November 1985)

5) High Average Cost/Low Track Capacity Network.

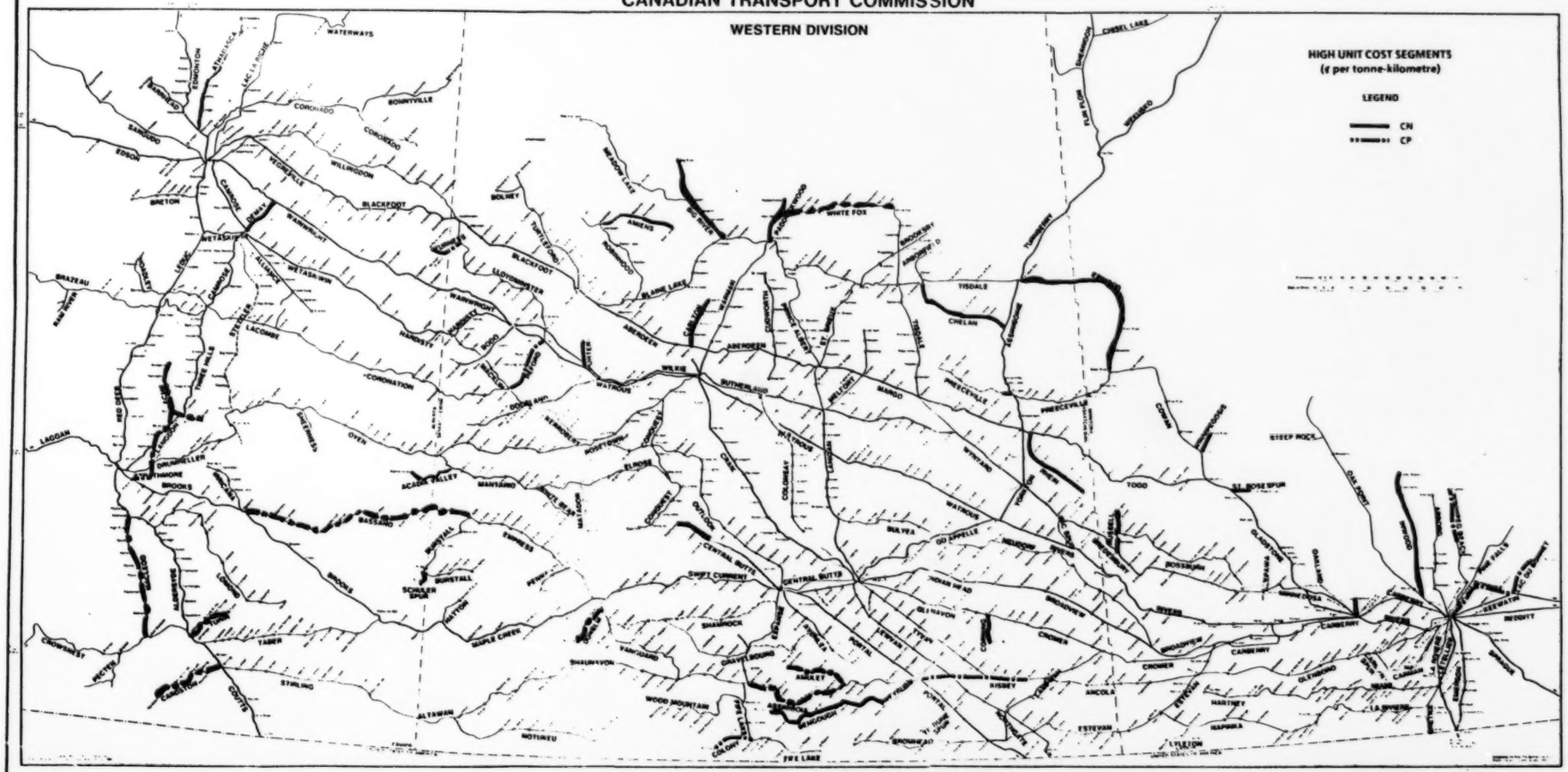
CANADIAN TRANSPORT COMMISSION

WESTERN DIVISION


LOW DENSITY STATIONS
ON GRAIN DEPENDENT BRANCH LINES
(1984)
LEGEND
CN CARS
0-50
51-100
101-150
CP
0-50
51-100
101-150
WATERWAYS
EDMONTON
ATHABASCA
LAC LA BICHE
CORONADO
BONNYVILLE
EDSON
VEGREVILLE
WILLINGDON
BRETON
CAMROSE
DRAYTON
WAINWRIGHT
BLACKFOOT
BOLNEY
TROCHU
WETASKIWIN
ALLIANCE
LLOYDMINSTER
BRAZEAU
LEDUC
CAMROSE
STETTLER
COLUMBIA
HANNA
ABERDEEN
CARLTON
WILKIE
WATROUS
CONDOR
CRAIG
COLONSAY
RUTHERLAND
MACKLIN
HERSO
CORONATION
MEADOW LAKE
BIG RIVER
ROSETOWN
WILKIE
WATROUS
RUTHERLAND
MARGO
WYNYARD
PREECEVILLE
WHITE FOX
TISDALE
CHELAN
TURNBERRY
ESPARADO
SHERBROOKE
CHESLEY LAKE
PAW FLOOD
WEEKES
STEEP ROCK
OAK POINT
TODO
ST. ROSE SPUR
BOSSBURN
GLADSTONE
OAKLAND
MINNEDOSA
RIVERS
CARBERRY
CROMER
BROADVIEW
GLENAYON
GRAVELBOURG
SHAMROCK
VANGUARD
ASSINIBOIA
ARMLEY
ROWATT
NEVILLE
ARCOLA
ESTEVAN
HARTNEY
NAPINKA
LYLETON
MOTHERWELL
ELKHORN
NEEPAWA
NEEPAWA
NEEDITY
SPRAGUE
WAWANESA
SWAN RIVER
ROBLIN
DAUPHIN
GILBERT PLAINS
MINITONAS
BENITO
SWAN RIVER
LA RIVIERE

CANADIAN TRANSPORT COMMISSION

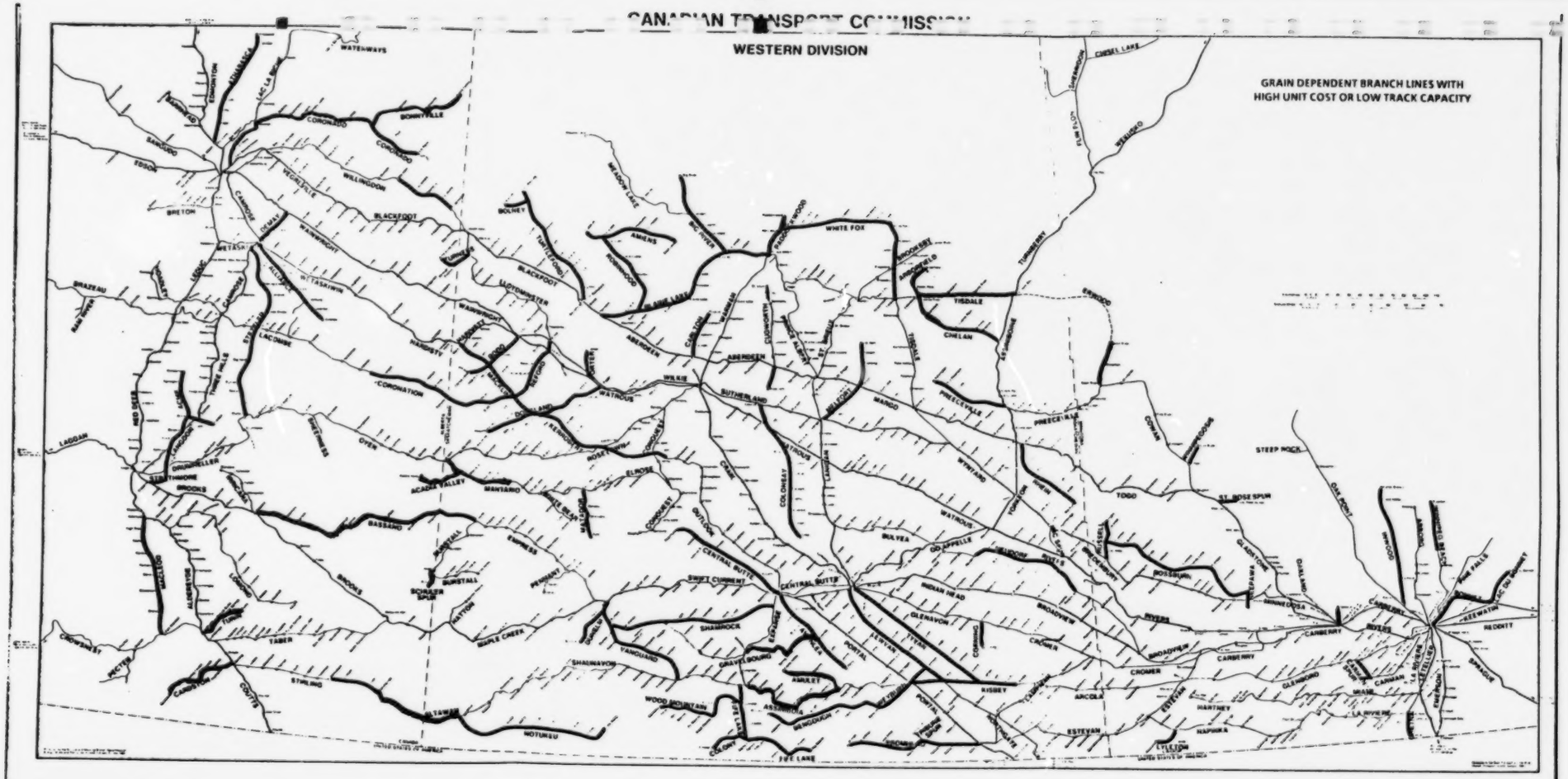
WESTERN DIVISION



CANADIAN TRANSPORT COMMISSION

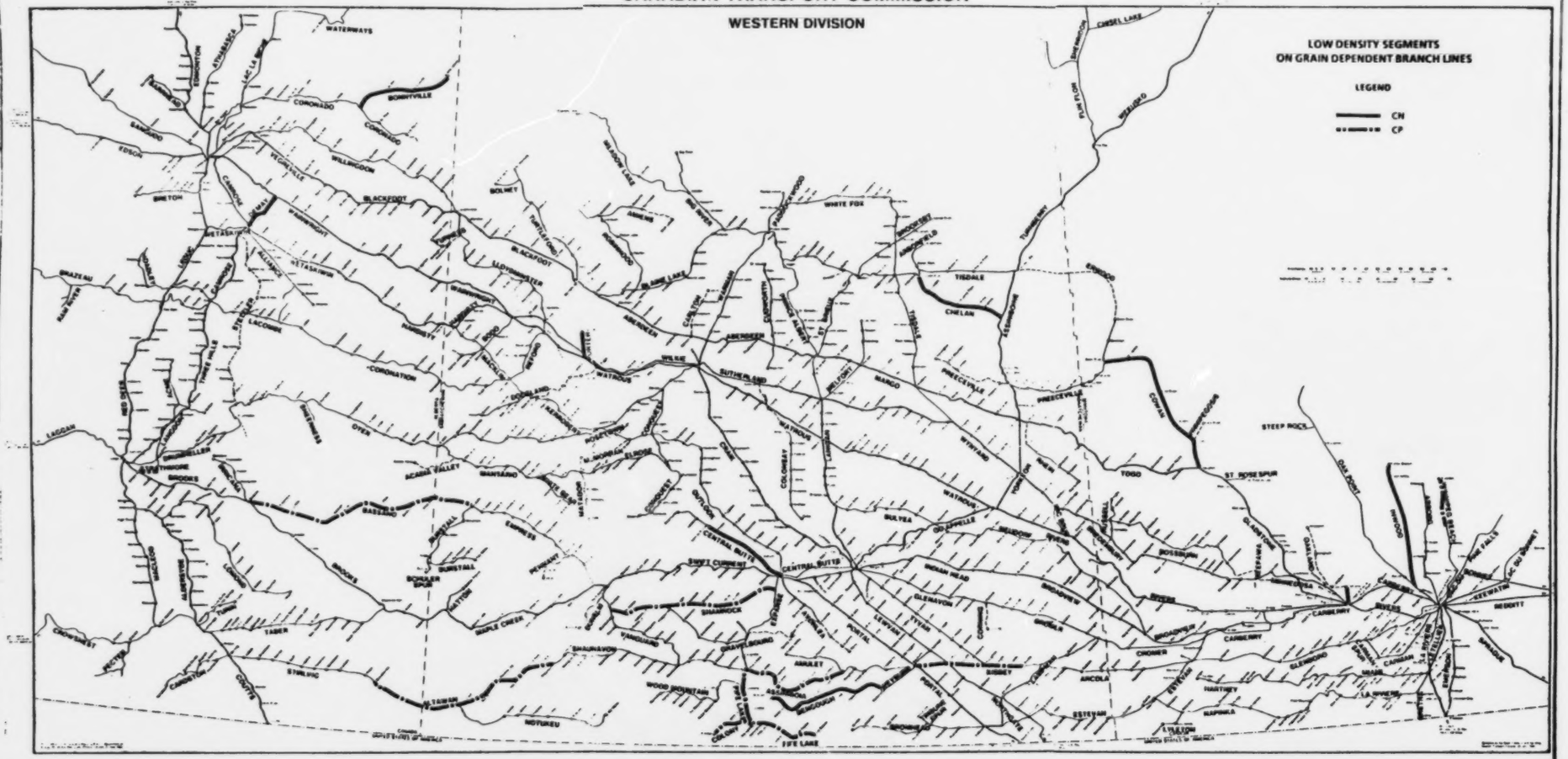
WESTERN DIVISION

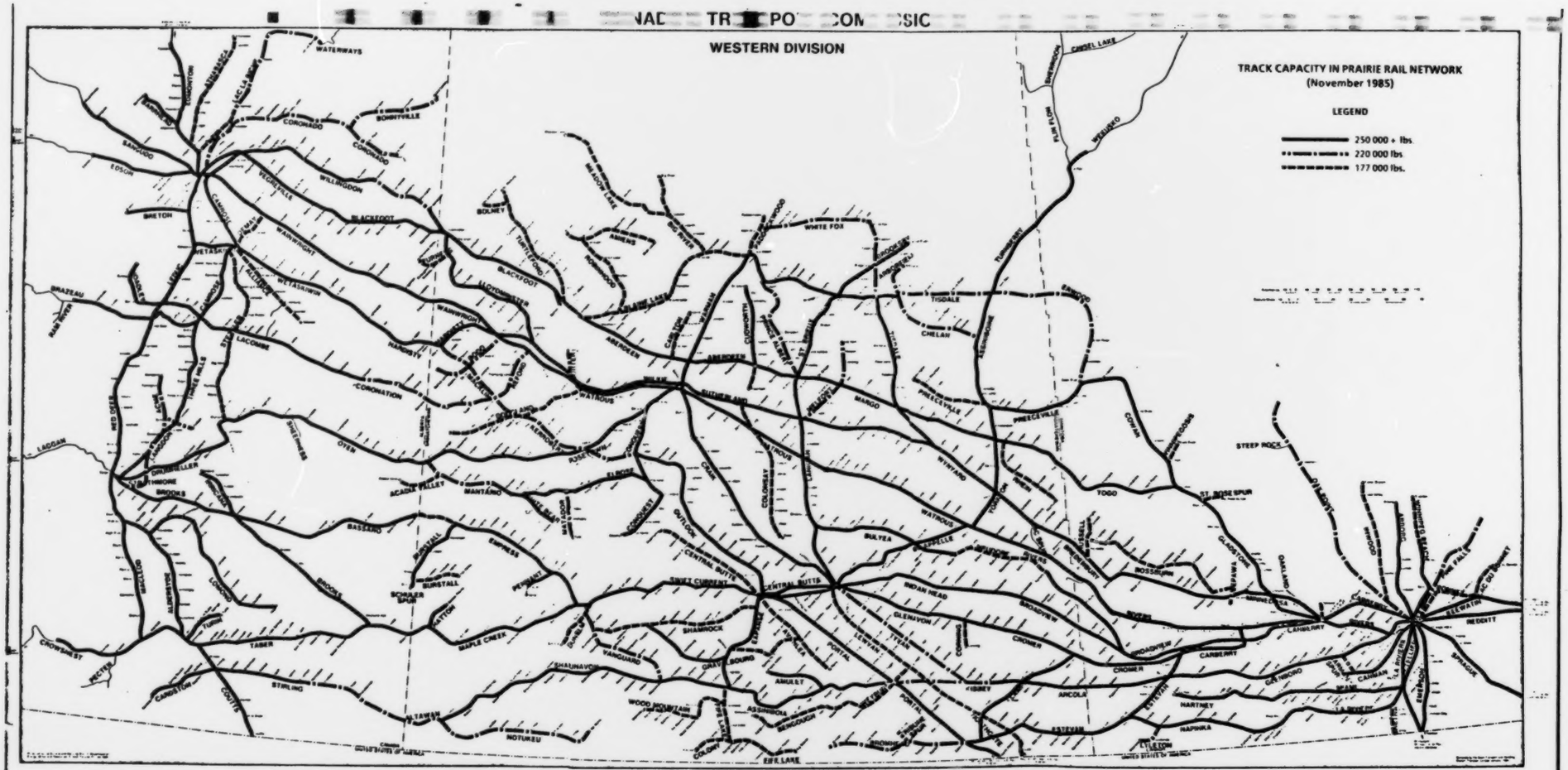
GRAIN DEPENDENT BRANCH LINES WITH
HIGH UNIT COST OR LOW TRACK CAPACITY



CANADIAN TRANSPORT COMMISSION

WESTERN DIVISION




WESTERN DIVISION
TRACK CAPACITY IN PRAIRIE RAIL NETWORK
(November 1985)
LEGEND
250 000 + lbs.
220 000 lbs.
177 000 lbs.
WATERWAYS
CONKLIN
CONKLIN
BONNYVILLE
CONKLIN
EDSON
WILLINGDON
BLACKFOOT
WAINWRIGHT
BRETON
CLAIRSON
WETASKIWIN
LACOMBE
RED DEER
CORONATION
HANNA
OYEN
WATROUS
ACADIA VALLEY
MANTARO
BASSANO
BROOKS
SUFFIELD
EMPRESS
DUNMORE
MEDICINE HAT
TABER
STIRLING
CARMANGAY
CROWSNEST
PICTURE BUTTE
COUTTS
NOTIKEWIN
WOOD MOUNTAIN
ELK LAKE
SHAUNAVON
MAPLE CREEK
SWIFT CURRENT
CENTRAL BUTTE
GRAVELBOURG
ASSINIBOIA
MOOSOMIN
WEYBURN
ESTEVAN
PORTAL
ARCOLA
AMULET
KISBEY
SHERWOOD
SOURIS
MELITA
BOISSEVAIN
MINTO
CROSSLEIGH
WILLOWBUNCH
WHITE FOX
SHELLBROOK
MEADOW LAKE
BIG RIVER
ROSEMOOD
TISDALE
CHELAN
PRINCE ALBERT
WINTARO
MANGO
PRINCEVILLE
TOGO
ST. BRIDES SPUR
BULYEA
WATROUS
INDIAN HEAD
GLENAVON
CROMER
BROADVIEW
CARLYLE
CARLYLE
GRENFELL
MOOSE JAW
MOOSE JAW
CENTRAL BUTTE
HARTNEY
NAPINKA
STEEP ROCK
GLADSTONE
ROSSBURN
OAKLAND
MINNEDOSA
BRANDON
MELBOURNE
REDDITT
SPRAGUE
WINNIPEG
CARTIER
PORTAGE LA PRAIRIE
SOURIS
SWAN RIVER
DAUPHIN
DAUPHIN
CANDEL LAKE
DAUPHIN
WILLIAM
WILLIAM